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Benefits of the Defense Standardization Program

NA105R1

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Robert L. Crosslin

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<p>13. ABSTRACT (Maximum 200 words)</p> <p>Military specifications and standards have been repeatedly criticized by the defense industry, program managers, the General Accounting Office, and the Congress as being excessively restrictive, obsolete, and costly.</p> <p>The Defense Standardization Program (DSP), created in the early 1950s, was designed to preclude those problems by eliminating unnecessary specifications, consolidating others, and increasing the use of non-Government standards. Although slow to develop, the DSP has taken on added importance within the past several years because of Department of Defense emphasis on bolstering defense industrial competitiveness, total quality management, and maximizing use of commercially available equipment and material. The Naval Facilities Engineering Command (NAVFAC) has responded by replacing more than 2,000 military specifications with non-Government standards. It has also been instrumental in canceling unneeded or duplicative specifications.</p> <p>Examples of NAVFAC's efforts include reducing the purchase cost of civil engineer support equipment by substituting commercial designs for military; lowering its costs to maintain standards by transferring the primary responsibility to non-Government organizations; and initiating the consolidation of Army, Air Force, and Navy specifications for electrical equipment into a single document.</p> <p>The benefits from those actions are substantial. They also justify continued effort by NAVFAC to lessen the burden of specifications and standards, principally on Navy procurements.</p>					
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Executive Summary

BENEFITS OF THE DEFENSE STANDARDIZATION PROGRAM

Military specifications and standards have been repeatedly criticized by the defense industry, program managers, the General Accounting Office, and Congress as being excessively restrictive, obsolete, and costly.

The Defense Standardization Program (DSP), created in the early 1950s, was designed to preclude those problems by eliminating unnecessary specifications, consolidating others, and increasing the use of non-Government standards. Although slow to develop, the DSP has taken on added importance within the past several years because of Department of Defense emphasis on bolstering defense industrial competitiveness, total quality management, and maximizing use of commercially available equipment and material. The Naval Facilities Engineering Command (NAVFAC) has responded by replacing more than 2,000 military specifications with non-Government standards. It also has been instrumental in canceling unneeded or duplicate specifications.

Examples of NAVFAC's efforts include reducing the purchase cost of civil engineer support equipment by substituting commercial designs for military; reducing its costs to maintain standards by transferring the primary responsibility for those standards to non-Government organizations; and initiating the consolidation of Army, Air Force, and Navy specifications for electrical equipment into a single document.

The benefits from those actions are substantial. They also justify continued effort by NAVFAC to lessen the burden of specifications and standards, principally on Navy procurements.

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CHAPTER 1

INTRODUCTION

Over the years, military specifications and standards have been widely criticized by the defense industry, military users, program managers, the General Accounting Office, and Congress. Their general opinion is that military specifications and standards are excessively restrictive, obsolete, and costly. Specifications and standards form the skeleton around which the defense acquisition process is built and are necessary to satisfy the primary objective of any procurement action: to obtain required products of suitable quality in the proper quantity in the time needed at the lowest possible price.

The Department of Defense initiates and maintains the largest body of specifications and standards in the world. The *Department of Defense Index of Specifications and Standards (DoDISS)* contains almost 50,000 documents and approximately 29,000 of those are active military specifications and standards. Both the 1977 Defense Science Board *Report of the Task Force on Specifications and Standards* (the Shea Report)¹ and the 1984 report, *An Assessment of the U.S. Defense Standardization and Specification Program* (the Toth Report),² concluded that while the existing body of specifications and standards essentially meets defense acquisition needs, considerable room for improvement remains. This remains true today. Numerous out-of-date and technologically obsolete documents still contribute significantly to problems that ultimately inhibit our productiveness and quality and, hence, our industrial competitiveness. Additionally, by eliminating the specifications and standards that contain obsolete, marginal, and unrealistic requirements, DoD can realize substantial savings.

The Naval Facilities Engineering Command (NAVFAC) has been actively promoting the use of non-Government standards (NGSs) and has adopted 2,000 such

¹Defense Science Board, *Report of the Task Force on Specifications and Standards*, Office of the Director of Defense Research and Engineering, Washington, D.C., 1977.

²R. B. Toth Associates, *An Assessment of the U.S. Defense Standardization and Specification Program*, Office of the Secretary of Defense, Directorate of Standardization and Acquisition Support, 1984.

documents. That activity is consistent with the recommendations of the *Final Report by the President's Blue Ribbon Commission on Defense Management* (the Packard Commission Report), which noted that substantial savings could be achieved by even greater reliance on NGSs rather than unduly restrictive military specifications for commercial products and processes.³ Using non-Government standards also helps support the industrial base by taking advantage of commercial items and processes already proven in the marketplace, while enhancing our mobilization capability.

This study demonstrates that NAVFAC's standardization efforts are both viable and important to the overall acquisition process and that the use of specifications and standards results in significant cost avoidance. In this study, we examine the benefits that the Navy has reaped from standardization efforts, drawing upon eight case studies in which either military or Federal specifications were consolidated, replaced with industry standards, or canceled. We begin with an overview of standardization in Chapter 2, describe our methodology in Chapter 3, and summarize the case studies and present our conclusions in Chapter 4.

³*Final Report by the President's Blue Ribbon Commission on Defense Management*, 1986, pp. 85 - 86.

CHAPTER 2

OVERVIEW OF STANDARDIZATION

Standardization is something that all of us take for granted. We drive an automobile from coast to coast under uniform traffic signals. We ship an electric freezer across the country with our household goods with never a conscious thought that it is sure to meet the same voltage and current wherever it is plugged in. In Seattle we buy a tire that was made in Akron, and it will fit the wheel (made in Pittsburgh) of the car (built in Detroit) that we bought in Atlanta. Our incandescent lamps find the same socket in Springfield, Va., and Springfield, Ill.

In our industrial beginnings, our standards were written by only two persons — the maker and the user. Perhaps their only exchange was the oldest of specifications: "Like the last one." The development of standards has become increasingly more complex as products have become more complicated. The number of organizations developing standards has also increased. Standards are now promulgated by both Governmental and non-Governmental organizations. Both play an important role in the standardization process.

NONGOVERNMENT STANDARDS

Non-Government standards for commercial products and processes are usually prepared by users, producers, consumers, academia, and others from both the private sector and Federal, state, and local governments serving on non-Government standards bodies. Those standards range from traffic signals to electric wiring, from specifications for fire hoses to safety specifications for children's toys. The American National Standards Institute or other non-Government standards bodies provide the vehicle by which those who are concerned with a product develop the standard. They do not attempt to dictate standards or otherwise manipulate the production process.

In the early days of standardization, the main objective was to permit quantity production to reduce costs. The consumer's choice is still based on the quality-purchase-price relationship but it also considers working life, reliability, repairability, ease of replacement, and so forth. Producers are aware of this and are concerned not only with after-sales service but with the subsequent fate of their

products and how components can be replaced (such as fittings and connections). For that reason, problems of interchangeability and compatibility are most important in standardization.

FEDERAL SPECIFICATIONS AND STANDARDS

Federal specifications and standards are documents that are of interest to, and coordinated with, two or more Federal agencies, at least one of which is an agency other than the DoD. The General Services Administration (GSA) retains the final responsibility (including preparation and maintenance) for all documents in the Federal series. That responsibility includes decisions to develop new Federal documents, to cancel existing Federal documents, and to revoke assignments or discontinue projects when the interest of the Federal Government requires such action.

In the past, policies governing the cancellation of Federal specifications and standards have limited the use of non-Government standards. Although DoD prepares most Federal specifications and standards, only GSA was authorized to cancel them. Currently, Federal specifications and standards may be canceled by the cognizant DoD preparing activity with the approval and concurrence of the GSA. This change should facilitate the cancellation of technically outdated Federal specifications and standards and the adoption of non-Government standards.

MILITARY SPECIFICATIONS AND STANDARDS

By definition, military specifications and standards are written to cover systems, subsystems, components, items, materials, or products that are intrinsically military in character. Yet, military specifications exist for toothpicks, dog muzzles, money bags, mustard, and many other items that could hardly be described as intrinsically military in character.

In the competitive environment in which the DoD must operate, specifications are needed to communicate requirements and ensure a specific level of quality. DoD's reluctance to abandon detailed specifications appears to be tied to a legitimate concern that without a specific statement of what the contractor is expected to provide, acquisition personnel will lose their leverage to force a contractor to supply products of sufficiently high quality. Without sufficiently detailed specifications, the argument goes, DoD (or the contracting agency) has nothing to hold the contractor to

in the event that the product does not turn out as promised. That attitude suggests that we cannot eliminate the use of detailed specifications unless we provide some mechanism for ensuring product quality.

Establishing military specifications for products that are obviously commercial creates several problems. It detracts from the primary reason we have military specifications – to establish the technical requirements for military equipment needed in combat. Further, it consumes the scarce resources needed for developing and maintaining military specifications that support military hardware and mission readiness.

DEFENSE STANDARDIZATION PROGRAM

The Defense Standardization Program (DSP) was part of the Cataloging and Standardization Act enacted in 1952. In response to the congressional mandate, DoD delineated its program in DoD Directive (DoDD) 4120.3, *Defense Standardization and Specification Program*, 15 October 1954. The procedures established at that time concentrated on “after-the-fact” standardization: the development of numbering systems, formats, procedures, and documentation practices for item reduction studies. This was a formidable task, at the time, because the practices of the individual Services had to be integrated into a single DoD-wide program.

The Cataloging and Standardization Act requires the Secretary of Defense to take the following actions:

- Develop and maintain the DSP
- Maintain liaison with industry advisory groups to coordinate the development of the DSP with the best practices of industry to obtain the fullest practicable cooperation and participation of industry
- Establish, publish, review, and revise, within DoD, military specifications, standards, and lists of qualified products and resolve differences between the Military Departments and agencies
- Assign responsibility for parts of the DSP to DoD components when practical and consistent with their interest
- Make final decisions in all matters concerned with the DSP.

In the almost 40 years since enactment of the Cataloging and Standardization Act, the DoD acquisition process has become more sophisticated. The Office of

Management and Budget (OMB) Circular A-109, *Major System Acquisitions*, and DoDD 5000.1, *Defense Acquisition*, were major achievements in refining the acquisition process to match the needs of the largest research and acquisition organization in the world. DoD's standardization program has attempted to keep pace. It has revised DoDD 4120.3 periodically, and the *Defense Standardization Manual*, DoD 4120.3-M, provides guidance on the application of standardization principles in defense acquisition.

Objectives of the Defense Standardization Program

The objectives of the DSP are as follows:

- Improve the operational readiness of the Military Services
- Conserve money, manpower, time, facilities, and natural resources
- Optimize the variety of items (including subsystems), processes, and practices used in acquisition and logistics support
- Enhance interchangeability, reliability, and maintainability of military equipment and supplies
- Ensure that products of requisite quality and minimum essential need are specified and obtained
- Ensure that specifications and standards are written to facilitate tailoring of prescribed requirements to the particular need
- Assure that specifications and standards imposed in acquisition programs are tailored to reflect only particular needs consistent with mission requirements.

Authority, Assignments, and Responsibilities

The DSP is a decentralized program with overall policy and administration centered in the Office of the Assistant Secretary of Defense for Production and Logistics (see Figure 2-1). Within each Military Department and the Defense Logistics Agency, a standardization focal point called the Departmental Standardization Office has the responsibility for translating these policies into specific objectives for their respective Military Departments or agencies. The Departmental Standardization Offices provide the centralized authority necessary to manage the 118 standardization management activities that prepare or contribute to the preparation of specifications and standards. Another important management

function is handled by the Lead Standardization Activities, which are responsible for ensuring the specifications and standards within an assigned Federal supply class (FSC) or standardization area comply with policies and maximize standardization of products and processes.

Departmental Standardization Offices

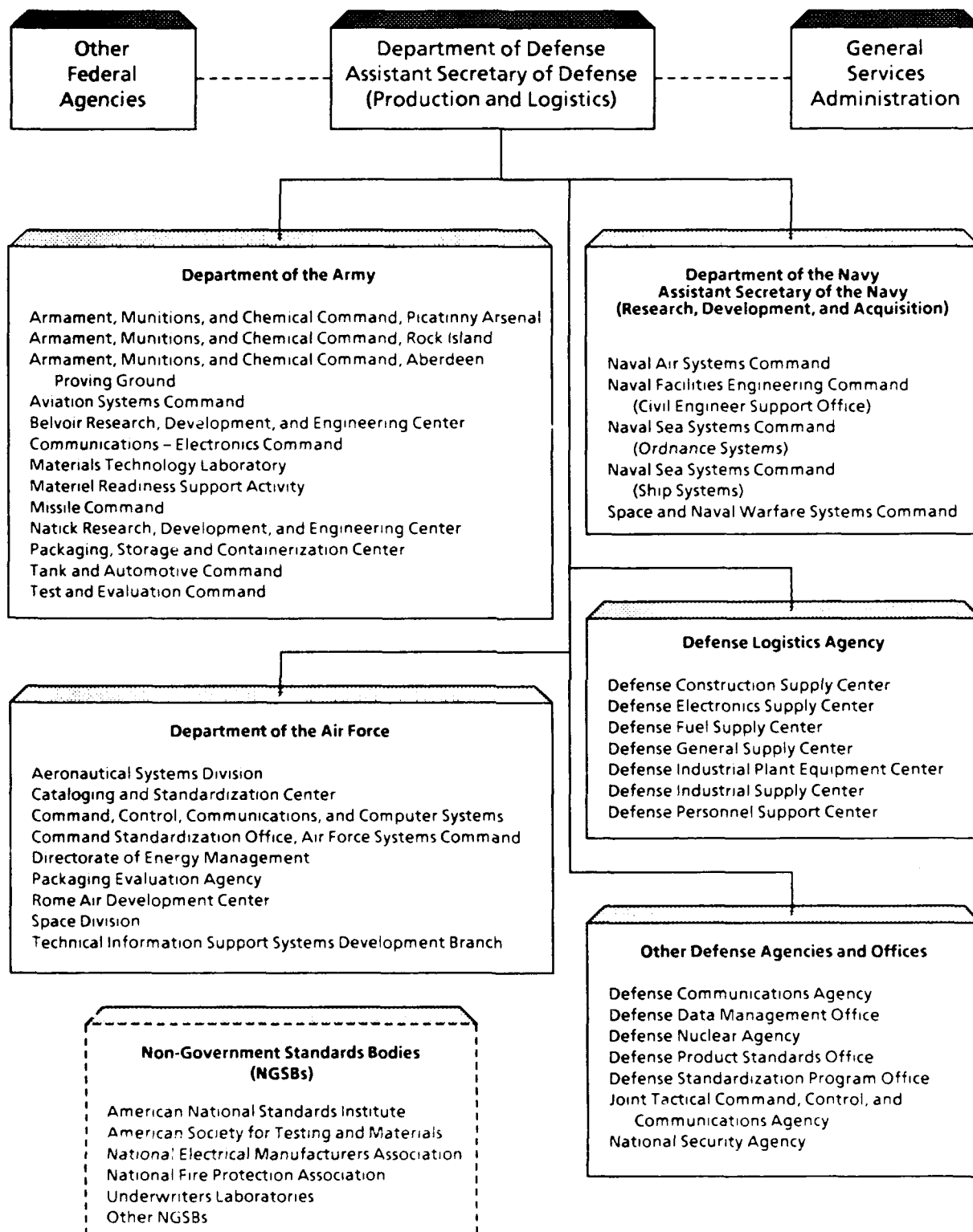
Day-to-day management responsibilities for the DSP are delegated to a single office within each Military Department and agency known as a Departmental Standardization Office. These offices are responsible for developing and implementing internal standardization guidance, ensuring that adequate budgets and staff are provided to support the program, and ensuring the implementation of policy. Each Departmental Standardization Office is also assigned a body of FSCs and standardization areas for which it serves as the DoD focal point to plan and manage all standardization actions in that class or area. This authority is usually delegated to another office known as the Lead Standardization Activity, which has the technical expertise to manage certain commodities or disciplines.

Lead Standardization Activities

Lead Standardization Activities are the management organizations delegated the responsibility for analyzing, planning for, and ensuring maximum standardization within an FSC or standardization area. They prepare standardization program plans to identify problems and opportunities; track the tasking in program plans to ensure implementation; authorize the development or revision of specifications and standards; and ensure that no FSC or standardization area has overlapping, duplicative, or technically outdated specifications or standards.

Funding

Funding for the DSP has been a serious management problem for a long time. Often, insufficient money is available to update technically outdated documents, to follow through on the tasks in program plans, to attend technical committee meetings to develop non-Government standards, and to accomplish the myriad other special standardization projects that might arise during the year. Repeated budget cuts, ceilings on salaries and personnel levels, and other factors have taken their toll on the DSP, and fewer people are responsible for maintaining a greater number of documents today than 20 years ago. For example, the Toth Report noted that in 1968



**FIG. 2-1. DEFENSE STANDARDIZATION PROGRAM
LEAD STANDARDIZATION ACTIVITIES**

the Army funded its portion of the DSP at a level of 1,021 workyears. In 1983, it was funded at a level of only 325 workyears.¹ Further reductions have occurred over the past several years.

Writing specifications and standards is not a glamorous occupation, and the only way the DSP can successfully compete for greater funding is by having managers demonstrate that the program more than pays its way with tangible savings, reduced costs, improved mission readiness, and more reliable logistics support. DoD no longer has the resources to be a de facto national standards organization. It and the private sector must expend more effort and resources to answer our national needs by developing more and better non-Government standards.

NAVFAC RESPONSIBILITIES UNDER THE DSP

The Naval Facilities Engineering Command's primary responsibility within the DSP is to ensure that procurement specifications are available and technically adequate to support the facilities engineering mission. It does so through the following activities:

- The development, maintenance, and review of military, Federal, and international specifications and standards
- Active participation in the development, coordination, and adoption of non-Government standards
- The incorporation of NAVFAC requirements in those documents prepared by other activities and agencies.

The Naval Facilities Engineering Command is the Lead Standardization Activity for facilities engineering and design requirements (area FACR). This area covers standard general facilities engineering and design criteria, practices, and guidelines. The NAVFAC responsibilities for standardization within Federal supply groups (FSGs) and FSCs are presented in Tables 2-1 and 2-2. It has delegated the functions of Lead Standardization Activity and participating activity to the Civil Engineer Support Office (CESO) at the Naval Construction Battalion Center, Port

¹R. B. Toth Associates, *An Assessment of the U.S. Defense Standardization and Specification Program*, Office of the Secretary of Defense, Directorate of Standardization and Acquisition Support, 1984.

Hueneme, Calif. In that role, CESO prepares program plans; initiates projects; and prepares, coordinates, and maintains standardization documents.

TABLE 2-1

NAVFAC RESPONSIBILITIES: LEAD STANDARDIZATION ACTIVITY

FSG/FSC	Title/commodity
1945	Pontoons and floating docks
3220	Woodworking machines
3230	Tools and attachments for woodworking machinery
3825	Road clearing and cleaning equipment
3835	Petroleum production and distribution equipment
3960	Elevators and escalators
4440	Driers, dehydrators, and anhydrators
5345	Disks and stones, abrasive
5350	Abrasive materials
54GP	Prefabricated structures and scaffolding
5410	Prefabricated and portable buildings
5430	Storage tanks
56GP	Construction and building materials
5610	Mineral construction materials, bulk
5620	Building glass, tile, brick and block
5630	Pipe and conduit, nonmetallic
5640	Wallboard, building paper, and thermal insulation materials
5650	Roofing and siding materials
5670	Building components, prefabricated
5680	Miscellaneous construction materials
7220	Floor coverings
8020	Paint and artists' brushes

In the past decade, NAVFAC has identified more than 3,000 non-Government standards that can be adopted to support the facilities engineering mission. As of August 1991, it had adopted 1,334 non-Government standards pursuant to OMB Circular A-119, *Federal Participation in the Development and Use of Voluntary Standards*, and DoD Instruction (DoDI) 4120.20, *Development and Use of Non-Government Specifications and Standards*. Currently, 2,086 non-Government

TABLE 2-2

NAVFAC RESPONSIBILITIES: PARTICIPATING ACTIVITY

FSG/FSC	Title/commodity
1955	Dredges
22GP	Railway equipment
2210	Locomotives
2220	Rail cars
2230	Right-of-way construction and maintenance equipment, railroad
2240	Locomotive and rail car accessories and components
2250	Track materials, railroad
2310	Passenger motor vehicles
2320	Trucks and truck tractors, wheeled
2330	Trailers
2340	Motorcycles, motor scooters, and bicycles
24GP	Tractors
2410	Tractors, full-track, low-speed
2420	Tractors, wheeled
2430	Tractors, track-laying, high-speed
25GP	Vehicular equipment components
2510	Vehicular cab, body, and frame structural components
2520	Vehicular power transmission components
2530	Vehicular brake, steering, axle, wheel, and track components
2540	Vehicular furniture and accessories
2590	Miscellaneous vehicular components
26GP	Tires and tubes
2610	Tires and tubes, pneumatic, except aircraft
2630	Tires, solid and cushion
2640	Tire rebuilding and tire and tube repair materials
28GP	Engines, turbines, and components
2805	Gas reciprocating engines except aircraft; and components
2830	Water turbines and water wheels and components
2910	Engine fuel system components, nonaircraft
2920	Engine electrical system components, nonaircraft
2930	Engine cooling system components, nonaircraft
2990	Miscellaneous engine accessories, nonaircraft
3020	Gears, pulleys, sprockets, and transmission chain
3030	Belting, drive belts, fan belts, and accessories
32GP	Woodworking machinery and equipment
3210	Sawmill and planing mill machinery
35GP	Service and trade equipment
3510	Laundry and dry cleaning equipment
3615	Pulp and paper industries machinery
3630	Clay and concrete products industries machinery
3655	Gas generating and dispensing system, fixed or mobile
3685	Specialized metal container manufacturing machinery and related equipment
3695	Miscellaneous special industry machinery

TABLE 2-2

NAVFAC RESPONSIBILITIES: PARTICIPATING ACTIVITY (Continued)

FSG/FSC	Title/commodity
37GP	Agricultural machinery and equipment
3710	Soil preparation equipment
3720	Harvesting equipment
3730	Dairy, poultry, and livestock equipment
3740	Pest, disease, and frost control equipment
3750	Gardening implements and tools
38GP	Construction, mining, excavating, and highway maintenance equipment
3805	Earth moving and excavating equipment
3810	Cranes and crane shovels
3815	Crane and crane shovel attachments
3820	Mining, rock drilling, earth boring, and related equipment
3830	Truck and tractor attachments
3895	Miscellaneous construction equipment
41GP	Refrigeration, air conditioning, and air circulation equipment
4110	Refrigeration equipment
4130	Refrigeration and air conditioning components
4140	Fans, air circulators, and blower equipment
42GP	Fire-fighting, rescue safety equipment
4210	Fire-fighting equipment
4230	Decontamination and impregnating equipment
45GP	Plumbing, heating, and sanitation equipment
4510	Plumbing fixtures and accessories
4520	Space heating equipment and domestic water heaters
4530	Fuel burning equipment
4540	Miscellaneous plumbing, heating, and sanitation equipment
46GP	Water purification and sewage treatment equipment
4610	Water purification equipment
4630	Sewage treatment equipment
49GP	Maintenance and repair shop equipment
4910	Motor vehicle maintenance and repair shop specialized equipment
4930	Lubrication and fuel dispensing equipment
4940	Miscellaneous maintenance and repair shop specialized equipment
52GP	Measuring tools
5210	Measuring tools, craftsmen's
5335	Metal screening
5340	Miscellaneous hardware
5360	Coil, flat, and wire springs
5365	Rings, shims, and spacers
5440	Scaffolding equipment and concrete forms
5445	Prefabricated tower structures

TABLE 2-2

NAVFAC RESPONSIBILITIES: PARTICIPATING ACTIVITY (Continued)

FSG/FSC	Title/commodity
5450	Miscellaneous prefabricated structures
5520	Millwork
5660	Fencing, fences, and gates
5975	Electrical hardware and supplies, except switches
6115	Generators and generator sets, electrical
6117	Solar electrical power systems
6220	Electric vehicular lights and fixtures
6260	Nonelectric lighting fixtures
63GP	Alarm, signal, and security detection systems
6310	Traffic and transit signal systems
6330	Railroad signal and warning devices
6670	Scales and balances
6675	Drafting, surveying, and mapping instruments
71GP	Furniture
7105	Household furniture
7125	Cabinets, lockers, bins, and shelving
7195	Miscellaneous furniture and fixtures
7240	Household and commercial utility containers
73GP	Food preparation and serving equipment
7310	Food cooking, baking, and serving equipment
7320	Kitchen equipment and appliances
7360	Sets, kits, outfits, food preparation, and serving equipment
79GP	Cleaning equipment and supplies
7910	Floor polishers and vacuum cleaning equipment
87GP	Agricultural supplies
8710	Forage and feed
8720	Fertilizers
8730	Seeds and nursery stock
9110	Fuels, solid
99GP	Miscellaneous
9905	Signs, advertising displays, and identification plates

standards are referenced in NAVFAC construction contracts although not all of them have been formally adopted by DoD. Figure 2-2 depicts NAVFAC's progress in adopting non-Government standards.

In addition to its work on using non-Government standards, NAVFAC is also responsible for preparing 374 military specifications and 224 Federal specifications, which includes 60 commercial item descriptions (CIDs).

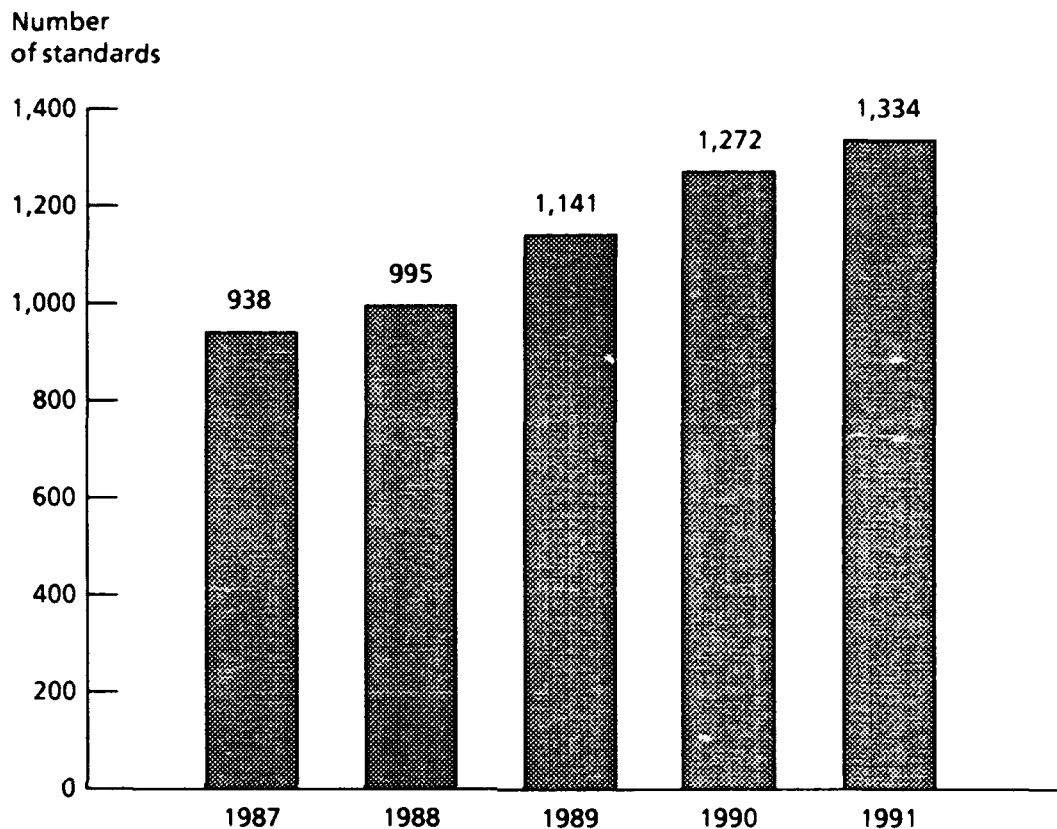


FIG. 2-2. NONGOVERNMENT STANDARDS ADOPTED BY NAVFAC

In FY86, DoD issued guidance to protect small, Government-only suppliers competing for acquisition and distribution of commercial products (ADCoP) contracts. Basically, that guidance allows small businesses that could not offer products with established commercial market acceptability the opportunity to compete by submitting bid samples in lieu of meeting commercial acceptability requirements. Bid samples from such a small business are not considered a condition for the submission of an offer, but, rather a requirement after the small business has been identified as the apparent successful offeror. When analysis of the bid samples indicate that the products offered will meet the Government's needs, award is made in accordance with the solicitation documents.

If a contracting officer determines that the Government's interests are urgent or compelling enough that award cannot be delayed pending evaluation of the bid sample, award is made to the next lowest responsive and responsible offeror. Bid

samples submitted for a current acquisition are evaluated prior to future solicitation for comparable items. Submitters of bid samples are advised whether their products will qualify for consideration in future solicitations. Bid samples must be the same as the products to be furnished under contract; the bidder cannot submit models, mockups, prototypes, experimental units, or other such items.

This guidance allows DoD to prepare CIDs that take advantage of the marketplace by requiring commercial market acceptability while still offering small business, noncommercial enterprises the opportunity to compete for Government business. Although first preference is still the use of non-Government standards, the use of the "commerciality" provision in contracting will enhance the utility of many non-Government standards. The Military Departments are rapidly making progress in the DoD ADCoP program. In FY88, NAVFAC and CESO prepared 100 percent of the CIDs used by the Navy. The use of CIDs has proven to be an effective, cost-efficient method to meet commercial acquisition needs.

CHAPTER 3

METHODOLOGY

INTRODUCTION

The Naval Facilities Engineering Command has realized significant benefits from its DSP efforts. Its tangible benefits range from administrative cost savings within NAVFAC to procurement-item price savings across the entire Federal Government. NAVFAC has also realized intangible benefits, such as increased cooperation with private industry and non-Government standards bodies.

Case study of individual standards issues is one approach that can be used to identify the benefits associated with the program. A representative sample of case studies, therefore, should provide a reasonable assessment of the types and size of program benefits.

CASE STUDY ANALYSIS

Case study analysis involves several phases. First, examples are selected to represent the types of standardization projects performed by NAVFAC, and the tangible and intangible benefits that accrue as a result. We examined 15 potential examples for the case studies and selected 10. We then developed a methodology to measure or estimate the tangible and intangible benefits for each example and gathered information for our analysis from NAVFAC, other Services, other Government agencies, and the private sector. After each case study, we summarized the results. Those case studies are presented in Appendices A through H of this report. [Specifications for concrete pipe and asphalt were initially among the 10 case studies agreed upon. Both involved actions to cancel Government specifications and adopt non-Government standards. The Government is still procuring the same materials under non-Government standards and the only savings are in administrative costs.]

The format we followed for the case studies – purpose, background, problems, discussion, outcomes, and payoffs – was prescribed by NAVFAC to be consistent with the format of other cases developed for use in the Defense Specification

Management Course; those case studies are used as teaching tools by the U.S. Army Logistics Management Center, Fort Lee, Va.

Analysis of Problems, Solutions, Outcomes, and Payoffs

For each example, we identified the problems caused by the specifications before any action by the NAVFAC standardization program. These problems included such things as higher prices without a mission-related benefit, long procurement lead times, incompatibility with the other Services, and poor working relationships with private industry. In each example, we discussed the major steps taken by NAVFAC's standardization program to correct the problems and the operational outcomes of the solutions. Finally, we measured or estimated the payoff (benefits) from the standardization actions.

Measurement of Benefits

We attempted to measure or estimate all of the quantifiable benefits derived from each case example. Quantifiable benefits come from three primary sources: administrative cost savings/avoidance, reduced equipment/material purchase costs, and reduced life-cycle operations and maintenance costs. Furthermore, each of those categories may produce savings for other Military Services and/or the rest of the Federal Government.

Administrative Cost Savings/Avoidance

Administrative cost savings/avoidance is a measurable benefit of cancellation of a Government specification (whether or not it is replaced with a non-Government standard). Military specifications are typically 20 to 30 pages long and typically reference 10 to 20 other Governmental and non-Governmental standards and specifications. The specifications tend to be technical because they state all of the requirements for manufacturing, testing, and operation and maintenance of the equipment or material. A technical staff member (GS-12, Step 3, average) must be assigned to write the specification and revise it on an average of every 5 years. To revise the specification accurately, the writer must keep abreast of the latest technology in private industry and how that can be applied to products covered by the Government specification. The typical life cycle for a Government specification is 20 to 25 years.

At NAVFAC, it costs, on average, about \$3,000 (FY91 dollars) a year to maintain a Government specification as shown in Table 3-1. By contrast, it only costs, on average, \$376 (FY91 dollars) to utilize a non-Government standard, using less time of the same technical staff member (see Table 3-2).

TABLE 3-1
NAVFAC COSTS TO DEVELOP/MAINTAIN SPECIFICATIONS
(FY91 dollars)

Task	Amount
Year 1 - Develop specification	13,300
Year 5 - Revise specification	8,800
Year 10 - Revise specification	8,800
Year 15 - Revise specification	8,800
Year 20 - Revise specification	8,800
Total life-cycle direct costs	48,500
Average annual direct costs	2,425
Labor burden	534
Total average annual costs	2,959

For the purposes of this report, we used these average annual administrative costs when calculating the administrative cost savings from canceling military/Federal specifications and/or adopting non-Government standards.

Reduced Equipment/Material Purchase Costs

The largest quantifiable benefit from the standardization program is the reduction in equipment/material purchase costs from the action(s). For example, when the Navy switches from purchasing tactical or nonindustry standard construction equipment to purchasing industry standard (i.e., "off-the-shelf") products, it usually realizes a substantial per-unit price savings. Depending on how many items the Navy (and the other Services and Government agencies) purchase each year, the savings figure can run into the millions of dollars.

TABLE 3-2
NAVFAC COSTS TO ADOPT NONGOVERNMENT STANDARDS
(FY91 dollars)

Task		Amount
Year 1	- Adopt NGS to replace MIL/FED specification	3,550
Year 5	- Readopt NGS	650
Year 10	- Readopt NGS	650
Year 15	- Readopt NGS	650
Year 20	- Readopt NGS	650
Total life-cycle direct costs		6,150
Average annual direct costs		308
Labor burden		68
Total average annual costs		376

Note: MIL/FED = military/Federal.

In the case studies, we took several approaches to measuring reductions in equipment/material purchase costs. If the item is purchased continuously every year, such as thermal insulation is, we calculated the annual savings and multiplied that annual savings times the expected life of the specification (e.g., 20 years) to arrive at an estimated "life-cycle" savings. In the case of large equipment items that are purchased infrequently and in small numbers, we calculated the actual savings obtained in the last 5 or 6 years by analyzing NAVFAC procurement records.

Where necessary, we consulted non-Navy and non-Government sources for data to support our calculations and estimates. For example, estimates of insulation as a proportion of mechanical costs were derived from a standard private-industry construction cost guide, and the product cost increase attributable to the use of Federal Government specifications was obtained by talking directly to manufacturers.

Reduced Operations and Maintenance Costs

Many of the case studies involved switching from nonindustry standard products to commercially available items. The commercial items are usually less expensive to operate and maintain because parts and supplies cost less and are more readily available. Although these cost savings are quantifiable, we were not able to measure them for the case studies because to do so would have required installation- and/or equipment-level historical data that were not readily available.

Selection of Cases for Study

The primary criteria that we established in selecting examples were that a military or Federal specification existed (possibly as a result of the efforts described in the example) and that the benefit was not primarily a result of changes in procurement practices (presumably, that benefit could have been gained without the standardization program). We also wanted examples in which NAVFAC was the Lead Standardization Activity in developing and maintaining the specifications for an area and examples that were primarily confined to the Navy. From 15 possible cases, we selected 10 for our case study and eventually eliminated 2, making a total of 8 cases as follows:

- Thermal insulation specifications
- Motor vehicle paint specifications
- Aircraft crash fire/rescue trucks specifications
- Naval Construction Force civil engineering support equipment (CESE) specifications
- Excavator specifications
- Floodlight-generator set specifications
- Power distribution panel specifications
- Boilers specifications.

Chapter 4 contains a brief description and summary of each case study.

CHAPTER 4

CASE STUDY FINDINGS AND CONCLUSIONS

In this chapter, we summarize the eight case studies on NAVFAC's standardization program. The full text of the case studies is presented in Appendices A through H. The summaries present a brief background of the case, the major problems that caused the standardization program action, and the major outcomes and benefits of that action.

THERMAL INSULATION

This case provides, by far, the largest dollar benefit of any of the cases studied and involves the largest number of changes and cancellations of individual Government specifications. NAVFAC is the designated proponent for specifications and standards on thermal insulation for the Federal Government; therefore, the effect is felt in all Federal Government construction.

In 1982, NAVFAC identified 59 Government specifications on thermal insulation as possible candidates for replacement by non-Government standards. In early 1982, at the request of NAVFAC, the American Society for Testing and Materials (ASTM) formed an administrative subcommittee on Government specifications on thermal insulation to help convert requirements in military and Federal thermal insulation specifications to ASTM standards. As of 20 June 1991, 33 Government specifications on thermal insulation had been canceled.

Some problems arose from the fact that regulatory agencies reference Federal standards in their regulations for thermal insulation, and no mechanism is available to update those regulations when a Government standard is replaced by an industry standard.

Of the 33 canceled Government specifications, NAVFAC has thus far converted 20 to industry (ASTM) standards, and the annual administrative savings on those 20 standards are \$51,655. Similarly, the annual administrative savings resulting from the 12 Government specifications canceled without replacement and the 1 duplicate military specification canceled are \$38,461. The annual savings of

\$90,016 cumulated^d over the 20-year expected life cycle of insulation standards is \$1.8 million (FY91 dollars).

Currently, NAVFAC completes about \$550 million of military construction (MILCON) projects each year that require thermal insulation. The insulation costs for those projects are about 10 percent of total mechanical costs, and the total mechanical costs are roughly 16 percent of total construction costs. The use of NGSs for thermal insulation in construction contracts will save an estimated 2 percent in insulation costs based on discussions with two major insulation manufacturers. Based on FY92 through FY95 MILCON estimates, the average amount of Navy construction requiring insulation in the future is about \$505 million. Therefore, NAVFAC will spend an average of \$8.9 million a year on insulation, and the savings realized from using NGS on insulation amount to \$160,800 annually. Other Federal Government agencies spend about 26 times as much on insulation as the Navy, and their savings are \$4,224,960 per year. Over the 20-year life cycle of the insulation specifications, the purchase savings to the Navy and other Federal Government agencies are \$3.2 million and \$84.5 million, respectively. Thus, the total life-cycle savings to the Government from insulations specification standards work completed to date by NAVFAC is \$89.5 million.

MOTOR VEHICLE PAINT

This case study is straightforward and provides a relatively small benefit per unit; however, the dollar savings are relatively large because of the large number of motor vehicles purchased every year by the Navy.

This case study summarizes the benefits to the Government associated with converting from vehicles with nonindustry standard colors to those with industry standard colors. The Navy uses commercially designed motor vehicles for a variety of administrative, mission, and operational support functions. These general-purpose vehicles include passenger-carrying motor vehicles, light trucks and vans, and trailers/truck tractors. The Department of the Navy owns 43,244 motor vehicles of this type (end of FY90) and leases an additional 12,542 vehicles.

The Navy purchases its motor vehicles through the GSA, but is responsible for operating and maintaining them. Department of Defense regulations specify the useful life of each vehicle type, and after that time, the vehicles are disposed of

through the Defense Logistics Agency's Defense Reutilization and Marketing Service and the Navy receives no money for them.

The Navy has purchased an average of 1,843 general-purpose motor vehicles annually over the past 6 years. Traditionally, it required all light trucks, vans, and tractor trailers purchased to be painted a nonindustry standard medium Navy gray (under FED-STD-595, *Colors Used in Government Procurement*, Chip 16187) and all sedans to be painted black under FED-STD-595, Chip 17038. These specifications require that GSA develop separate invitations for bids, which result in these vehicles not being part of GSA's volume purchase agreement with the major manufacturers. Furthermore, the gray, nonindustry standard paint required by the Navy is a poorer quality and requires greater maintenance. The Navy's special paint requirements are not intrinsically military in nature nor mission essential, and since available commercial colors do not conflict with the requirements of the activity, they should be used.

The CESO is responsible for managing the acquisition of all motor vehicles for the Navy. In 1979, it requested that to reduce costs, NAVFAC should no longer require nonindustry standard paint colors for its motor vehicle fleet. CESO found that "Pure White" was the only color that is standard to all American car manufacturers, and NAVFAC has since purchased vehicles in that color.

The General Accounting Office (GAO) estimates the dollar savings of buying an industry standard paint color for Navy vehicles to be \$100 per vehicle (FY91 dollars).¹ Over the past 6 years, on an average annual basis, the Navy has purchased 1,843 general-purpose motor vehicles. Therefore, the annual savings from changing to the industry standard paint color is \$184,300. Over a 20-year period, the Government would save \$3.7 million (FY91 dollars) by eliminating the Navy's specification for a nonindustry standard paint color for general-purpose motor vehicles.

AIRCRAFT CRASH FIRE/RESCUE TRUCKS

This is one of two case studies in which the Navy initially planned to participate in a procurement with another Government agency for a nonindustry standard piece of equipment and instead wrote a purchase description and subsequently military

¹General Accounting Office, Report GAO/NSIAD-91-132, *Motor Vehicles: Better Management of the Military Services' Vehicles Could Save Millions*, May 1991.

specification MIL-T-28571 for commercially available equipment, saving significant amounts of money in the process.

The Navy requires fire trucks at its shore installations for a variety of fire-fighting, crash, rescue, and other related functions. Most of the trucks at Naval Air Stations are 25 years old and must be replaced. Those trucks require significant maintenance because of their age. In addition, since many parts are no longer available, many repairs require the fabrication of custom-made parts. Thus, some repairs can take up to several months. For example, one of these trucks recently suffered a broken axle, the axle had to be custom-made, and the truck was out of commission for several months.

The Air Force (Warner Robins Air Logistics Center) prepares and maintains the military specification for crash fire/rescue trucks. That specification, MIL-T-27213, describes a diesel-driven crash fire/rescue truck with a 3,000-gallon water capacity. NAVFAC had originally planned to participate in the Air Force buy of these vehicles to meet its own requirements for crash fire/rescue trucks at Naval Air Stations. However, after studying the mission requirements for crash fire/rescue trucks, NAVFAC ultimately decided to purchase a commercial "off-the-shelf" version under a purchase description (PD). This decision was made after NAVFAC concluded that use of military specification MIL-T-27213 to procure the trucks would result in a custom-designed vehicle at a significant increase in cost without a matching increase in needed functionality. In addition, custom-designed vehicles would require higher maintenance costs because of special orders and/or custom design of parts.

The Navy's purchase description references the essential component military and Federal specifications and standards needed in the vehicles. Most of these specifications and standards are also referenced in the Air Force's military specification. The primary differences between the Air Force truck and the Navy truck are independent suspension and the self-deflating, and self-inflating capability of the Air Force tires when the vehicle switches from on-road to off-road and back again.

The dollar savings from buying commercially designed vehicles instead of military specification vehicles is significant. NAVFAC issued an invitation for bids using the purchase description and has awarded a contract for commercially designed crash fire/rescue trucks. The contract calls for a base purchase of 16 vehicles and an

option for 16 more. The amount saved on the 16 trucks purchased is \$177,000 per unit (FY91 dollars), or \$2.8 million for the 16 trucks; the amount saved on the 16 trucks under the option is \$144,000 per truck, or \$2.3 million (FY91 dollars). Therefore, the total savings to the Government from purchasing 32 commercially designed crash fire/rescue trucks for Naval Air Stations is \$5.1 million.

COMMERCIAL CONSTRUCTION EQUIPMENT FOR THE SEABEES

The Navy purchases numerous pieces of tactical equipment. However, in many instances, the mission is of a commercial nature and commercial equipment will suffice. This case study is an example of how the standardization program identifies those instances and provides significant savings to the Government in the process.

This case study summarizes the benefits associated with converting from tactical to commercial construction equipment for Naval Mobile Construction Battalions (NMCBs). Prior to World War II, the Navy relied exclusively on the services of contractors and their civilian employees for naval construction projects overseas. However, the Navy felt those civilians should not work in combat zones. At the beginning of World War II, it created its own uniformed construction force – the Seabees – to serve under officers of the Civil Engineer Corps. A construction battalion consists of a headquarters company and four construction companies with all the necessary skills for any construction job. The primary function of Seabees is to construct advance bases, typically inland after the establishment of a beachhead by the Marines, possibly including piers, docks, and airstrips. Currently, the Navy has 8 active and 17 reserve NMCBs.

Each NMCB has an allowance of equipment to perform its mission. That allowance is designated as the Advance Base Functional Component P-25. Equipment to maintain the allowance is procured by NAVFAC through CESO. A major portion of that allowance is the CESE component. Until the mid-1980s, many of the items in the P-25 CESE component were purchased as tactical, instead of commercial, equipment. The reasoning was that only tactical equipment could satisfy the Seabee's mission.

Tactical construction equipment has been more expensive to purchase and maintain than commercial construction equipment because of the added specifications necessary to meet the requirements. In addition, replacement and repair costs, along with procurement delays in obtaining the equipment, caused

problems in maintaining P-25 CESE component allowances at desired quantity/quality levels.

In 1984, NAVFAC made a policy decision that the CESE component of the P-25 allowance should be all commercial equipment (with a few exceptions). The reason for the policy decision was that the P-25 CESE component is for a commercial, not military, mission. Since that time, items in the P-25 CESE component have been purchased commercially. Applicable military specifications and standards apply as necessary. Many of these commercial items will be procured on GSA multischedule contracts in the future, as GSA continues to develop more lines.

The dollar savings of buying commercial, instead of tactical, construction equipment are significant. Because NAVFAC does not procure entire P-25 CESE components at one time, and because the equipment has a relatively long useful life, we cannot show actual savings to date for total P-25 CESE components. The Navy has saved over \$4 million (FY91 dollars) in FY87 – FY89 on the purchase of just five items in the P-25 CESE component. The purchasing of commercial, instead of tactical, construction equipment for the Seabees will continue to save the Government millions of dollars.

COMMERCIAL EXCAVATORS FOR THE SEABEES

This case study summarizes the benefits associated with purchasing standard commercial excavators rather than special excavators for NMCBs.

Each P-25 CESE component has an allowance of two excavators. Of the three basic types of excavators, one type is mounted on a truck and has not been procured for NMCBs, and the other two types are self-propelled by a diesel engine and roll on either inflatable tires (i.e., tire-mounted) or tracks (i.e., crawler-mounted). All three types have a revolving upper structure, a backhoe-type boom, general-purpose buckets, a hydraulic hammer-pavement breaker, and mounted work lights. Excavators are used by the Seabees for a variety of purposes including excavation, grading, road repair, and rapid runway repair.

Traditionally, Seabees preferred the crawler-mounted excavator. In the mid-1980s, NAVFAC decided to switch to the tire-mounted version, which it believed would provide more versatility in certain situations. For example, when performing rapid runway repair (e.g., after bomb damage to a runway), the tire-mounted

excavator would not damage runway surfaces because it would not have metal tracks. In addition, the tire-mounted version would eliminate the need for a tractor and trailer to transport the equipment.

At the same time, the Air Force was also in the process of procuring a tire-mounted excavator. The Air Force PD called for an all-terrain, all-wheel (e.g., six-drive) excavator with a special steel undercarriage. The Air Force did not plan to buy all of the option units in its contract. The Navy initially planned to participate in the Air Force procurement since the Navy did not have either a PD or a military specification for a tire-mounted excavator.

The Naval Facilities Engineering Command did not participate in the Air Force procurement, and instead wrote it's own PD for a standard commercial tire-mounted excavator. The PD has since been converted to a military specification (MIL-E-29249, *Excavator, Multipurpose, Wheel-Undercarriage, Diesel-Engine-Driven*) for general procurement use. The equipment category code (ECC) of the unit in the P-25 CESE component is 4340-01. Excavators of this type were procured for Seabee use and satisfactorily met their mission requirements. The Seabees have recently reverted to crawler-mounted excavators as the *prime piece of equipment* in their allowance (ECC 4350-01), and the tire-mounted version is not in stock. In both the crawler- and tire-mounted cases, standard commercial versions are procured by NAVFAC, as opposed to the specially designed and constructed all-terrain excavator.

The savings for buying commercial excavators instead of specially designed and manufactured excavators are significant. From FY88 to the present, NAVFAC has saved approximately \$1 million (FY91 dollars) on this one item.

NONTACTICAL FLOODLIGHT SETS

This case study summarizes the benefits to the Navy associated with defining military specifications for floodlight sets that meet Navy nontactical needs and can be procured commercially.

Department of Defense Directive 4120.11, *Standardization of Mobile Electric Power Generating Sources*, created the Mobile Electric Power (MEP) program under the Secretary of the Army. Under that program each Service is required to purchase all mobile generators from a prescribed family of generators. Since floodlight sets

include generators as a major component, they were enveloped by the MEP directive although floodlight sets are not used for tactical purposes.

The Army advised the Navy that it would take 16 to 24 months to receive the generators. Once the Navy received the generators, it would still be required to assemble them. However, floodlight sets that met the Navy's nontactical needs were commercially available and fully assembled although they did not have MEP generators.

The MEP generators are tactically quiet and designed for military field use. Naval shore installations do not need tactically quiet generators nor do they need to be concerned with interchangeability of generators and equipment when the generators are being used solely for a commercially compatible function. In addition, the Seabees also use commercial floodlight sets (without MEP generators).

In 1984, NAVFAC wrote military specification MIL-F-29161 to match commercially available floodlight sets that suited the Navy's nontactical needs for the Seabees and shore installations because it was unable to make a timely procurement of MEP generators for use in assembling mobile floodlight sets. The specification describes an electric, diesel-engine-driven, trailer-mounted floodlight set. The specification is used by NAVFAC to purchase commercially available floodlight sets for the Seabees and Public Works Departments at shore installations. Floodlight sets for these nontactical uses are now purchased at significantly reduced costs and without the delays created by the MEP program.

The greatest payoff to the Navy, albeit the least quantifiable, is the timely procurement of a much needed piece of equipment. The floodlight sets are needed to allow for work where natural light is poor or nonexistent. Construction, repair, and maintenance can now continue without regard to the time of day and the amount of natural light at the work site.

The dollar savings of buying a commercially available floodlight set versus assembling one from separate components are significant. The last procurement for a MEP generator similar to the one included in a floodlight set cost \$9,548 (FY91 dollars). The costs of luminaries, telescoping tower and mast, ballast, connecting wiring, and a half day's labor to construct the floodlight set are an additional \$4,071.

Alternatively, the comparable commercial floodlight set (6KV, 4 luminaries/1000W) cost \$10,850 (FY91 dollars) per unit. The purchase cost saving therefore is \$2,769. The Navy purchases an average of 25 floodlight sets (for Seabees and shore installations) per year. The average annual purchase savings are \$69,225 (FY91 dollars). Of course, NAVFAC must maintain the military specification for commercial floodlight sets at an average annual cost of \$3,000, bringing the total net annual savings to \$66,225. Over a 20-year period, this results in a \$1,324,500 savings to the Government.

STANDARDIZED POWER DISTRIBUTION PANELS

This case is an example of how the three Military Services' standardization programs work together to develop common specifications to meet common needs, saving the Government significant money, and providing field compatibility/interchangeability in the process.

Power distribution panels (PDPs) help distribute remotely generated power for field installations that require heavy loads and circuit protection. In developing PDPs, major considerations must be devoted to adverse environments in which humidity, temperature, and salt atmospheres can deteriorate the protective devices and affect operating limits. To meet individualized needs, each Military Department developed standards for a generator family and associated PDPs that addressed its own needs. The result was PDPs that were not interchangeable because of differences in connectors, circuits, and power levels.

In FY80, NAVFAC developed a family of PDPs and associated interconnecting distribution cabling specifications (MIL-P-29183 and MIL-C-29184). In FY85, all the Military Departments recognized the need for a standardized family of PDPs and formed a committee to address the problem. Because the Navy's standardized family of PDPs and cable was already operational with developed hardware and met most of the Services' requirements, the committee selected NAVFAC's military specifications as the basis for the PDP family.

The DoD is currently using these specifications to meet all PDP procurement needs. The standardized systems can easily be installed and distribute power to networks tailored to individual requirements. NAVFAC continues to maintain the military specifications and standards for PDPs for DoD.

The Army and Air Force each save about \$6,000 a year in administrative costs because they no longer need to maintain separate PDP specifications and standards. Other, nonquantifiable, benefits resulted from the PDP standardization. For example, product qualification, production testing and attendant reports, data submissions, and quality recertification testing have been minimized.

The standardization of PDPs among the Services has made possible larger quantity purchases in competitive procurements, which has reduced unit costs by as much as one-half on many panel boards.

NEW AND REVISED MILITARY SPECIFICATIONS FOR BOILERS

This case provides an example of how the standardization program can resolve procurement and inspection problems caused by differences between industry criteria and military specifications and by adding specifications to meet unique DoD requirements.

The Federal Government, including the Navy, owns thousands of buildings, most of which use boilers as the primary source of space heating. Boiler plants are also important to many Navy and other Government industrial activities. The Federal Government spends tens of millions of dollars each year on the purchase, operation, maintenance, and repair of boilers.

Boilers are manufactured in many sizes, ranging from "package boilers" that are relatively small, self-contained units requiring little or no operation and maintenance by trained workers to large, complex boiler plants that provide heat to all buildings on a military installation and require full-time operation by specially trained workers.

Boilers use a variety of fuels, including gas, oil, and coal, and in some cases, DoD requires them to operate on both primary and alternative fuels (e.g., gas as the primary fuel and coal as the alternative).

The specific uses of a particular boiler application, including the alternative fuels requirement, make it important to use proper specifications in procurement actions. Prior to 1990, the Navy maintained seven military specifications for boilers. However, those specifications did not always contain criteria that were consistent

with private-industry criteria for rating boilers. Also, those specifications did not contain the DoD alternative fuels requirements.

The inconsistencies between boiler rating criteria of the Federal Government and private industry, differences between Government design requirements and industry design practices, and the lack of specifications for the DoD alternative fuels requirements have created numerous administrative and operational problems. For example, the differences in boiler rating criteria caused Government inspectors to raise military specification compliance issues with some manufacturers' products. And, differences between Government design requirements and industry practices caused some manufacturers to believe that their products were being discriminated against, resulting in numerous bid protests that lengthened and increased the costs of procurement actions.

In 1984, NAVFAC began a program of revising the military specifications for boilers to resolve the problems discussed above. The seven original specifications were revised to eliminate inconsistencies in terminology. The specifications were also revised to minimize conflicts between Government-specific design requirements and current industry design practices. Finally, four new specifications were added to ensure that DoD's alternative fuels requirements for steam, or power generating, plant construction were included.

One of the most visible benefits of the Navy program to date is that the Navy has not received a single bid protest in its boiler procurements since it started using the revised and new specifications. Other Government agencies have probably also experienced a significant decline in bid protests. Without protests to resolve, the Navy has experienced shorter lead times and shorter procurement cycles for all types of boilers. Because the revised specifications were published only 1 year ago, it is too early to know whether compliance issues will disappear; however, we fully expect such issues to decrease significantly because of the congruence of Government and private-industry terminology achieved by the revised specifications. Another significant benefit is that the new specifications ensure that properly manufactured and sized boilers can be procured for burning alternative fuels.

SUMMARY

Our analysis of the case studies has shown that the Navy's standardization program as implemented by NAVFAC has resulted in significant savings. At the

same time the ability to use the industrial base to support mobilization has been enhanced by increasing the number of commercially available items the military can use. The program is effective and NAVFAC should continue its efforts to use commercial standards whenever appropriate.

APPENDIX A

**CONSOLIDATION OF MILITARY AND FEDERAL
SPECIFICATIONS AND NONGOVERNMENT STANDARDS
FOR THERMAL INSULATION RESULTS IN SIGNIFICANT
COST SAVINGS**

CONSOLIDATION OF MILITARY AND FEDERAL SPECIFICATIONS AND NONGOVERNMENT STANDARDS FOR THERMAL INSULATION RESULTS IN SIGNIFICANT COST SAVINGS

PURPOSE

This case study summarizes the benefits associated with replacing Government specifications for thermal insulation with non-Government standards (NGS) and estimates the cost savings to the Government from these activities.

BACKGROUND

In 1982, the *Department of Defense Index of Specifications and Standards* contained nearly 60 Federal and military specifications for thermal insulation, and many of those specifications were duplicative and obsolete. These specifications are used throughout the Government in construction contracts and procurement contracts (e.g., for building materials). The Naval Facilities Engineering Command (NAVFAC), as the lead standardization activity, is responsible for development, preparation, and implementation of a program plan for standardization of thermal insulation products. It has implemented a policy of replacing Government documents with non-Government standards whenever possible.

PROBLEMS

In compliance with Office of Management and Budget (OMB) Circular A-119, *Federal Participation in the Development and Use of Voluntary Standards*, and DoD Instruction 4120.20, *Development and Use of Non-Government Specifications and Standards*, NAVFAC reviewed all documents on thermal insulation for which it was the controlling activity. Its review revealed duplication of effort in maintaining specifications for the same product by different Government agencies and industry. Two examples are presented in Table A-1.

In its initial review, NAVFAC found that many people in industry are skeptical that the Government would cancel and replace its own specifications with industry standards. They felt that the Government would only accept industry standards after

TABLE A-1
EXAMPLES OF DUPLICATE SPECIFICATIONS

Perlite insulation specifications	Calcium silicate insulation specifications
A-A-903 – Insulation, Thermal (Expanded Perlite)	H-H-I-523 – Insulation Block and Pipe Covering Thermal (Calcium Silicate for temperatures up to 1,200° F)
H-H-I-574 – Insulation, Thermal (Perlite)	MIL-I-2781 – Insulation, Pipe, Thermal
ASTM C549 – Standard Specification for Perlite Loose Fill Insulation	MIL-I-2819 – Insulation Block, Thermal
	ASTM C533 – Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation

influencing the non-Government standards bodies (NGSB) to rewrite private industry specifications to duplicate existing military or Federal specifications.

Some Government agencies, most notably military activities, did not want to convert from military to industry standards. They felt they would lose control of the quality of the product. They also insisted that the packaging and markings required in the military documents be included in the industry standards.

Additional problems stemmed from the fact that regulatory agencies such as the Consumer Product Safety Commission (CPSC) reference Federal standards in their regulations for thermal insulation and no mechanism is available to update those regulations when a Government standard is replaced by an industry standard. For example, HH-I-515 is referenced in a CPSC regulation for cellulosic insulation. The General Services Administration (GSA) canceled its specification HH-I-515 on 27 September 1985 and adopted the American Society for Testing and Materials (ASTM) specification C739 as its replacement; however, the HH-I-515 specification is still referenced by CPSC regulations.

DISCUSSION

The intent of OMB Circular A-119 is to adopt industry documents for commercial products when they satisfy military needs. If specific or unique military

requirements are necessary, the document should remain a military specification and the industry document should be used as its basis.

Civil and military activities must realize that industry standards will never be identical to existing Government standards; however, the industry standard should address the minimal technical requirements of the Government.

Minimal technical requirements do not include packaging or marking. Technical requirements should adequately define the product or material for procurement. Packaging and marking requirements should be included in a contract or purchase order (i.e., "boilerplate"), not in a product specification. NAVFAC has adopted documents that include statements such as "Unless otherwise specified in the contract or order, packaging shall be manufacturer's standard pack." The use of such documents allows the Government to buy commercial and specify additional packaging when required.

Government bodies responsible for revising and writing Government specifications should be actively involved with NGSBs in converting Government standards to industry standards. The Government will benefit from this interaction with industry experts, resulting in high quality purchases of industry standard products at favorable prices.

OUTCOME

In early 1982, at the request of NAVFAC, the ASTM formed an administrative subcommittee on Government specifications on thermal insulation to help convert requirements in military and Federal thermal insulation specifications to ASTM standards. The subcommittee was to identify Government specifications for commercial grade insulation and accessories and convert those specifications to existing ASTM standards or develop new ASTM standards. Fifty-nine Government specifications on thermal insulation were identified as possible candidates for replacements by ASTM specifications. As of 20 June 1991, 33 Government specifications on thermal insulation had been canceled (see Tables A-2 and A-3).

PAYOFFS

The nonquantifiable gains of changing Government specifications on thermal insulation to industry standards include increased productivity in operations and maintenance gained from being abreast of the latest technology. The NGSB

TABLE A-2
SUMMARY OF CANCELED INSULATION SPECIFICATIONS

Replaced by non-Government standards	20
Canceled without replacement	12
MIL-spec, duplicative of FED-spec, canceled	1
Total Government specifications canceled	33

members are forced to stay on the leading edge of technology to remain in business; the Government gains from applying its technical knowledge to industry specifications. Because suppliers are more familiar with ASTM standards, the supply base may actually increase and suppliers will not be able to charge extra simply because an unfamiliar military or Federal specification is cited in the contract. The consolidation of Government specifications with industry standards has also streamlined the procurement of insulation materials worldwide by providing a means to purchase commercially available products rather than waiting for specially designed or packaged materials to meet Government specifications. In addition, many state and local governments refer to Federal Government insulation specifications, and the consolidation will benefit them as well.

The quantifiable gains are from both administrative, and material purchase, savings. The use of non-Government standards (NGS) reduces the duplication of effort between the private and public sector to create and revise specifications, as well as reducing redundant Government specifications. The administrative costs for maintaining a specification are reduced dramatically.

A Government specification costs the Government an average of \$2,959 a year, assuming a 20-year life for the specification with revisions and modifications made every 5 years after the specification is written (see Table A-4). Adopting a non-Government specification under the same assumptions costs the Government an average of \$376 a year – an annual administrative savings of \$2,583. Therefore, the annual administrative savings from the 20 Government specifications that NAVFAC has thus far converted to industry (ASTM) standards is \$51,655. Similarly, the annual administrative savings resulting from the 12 Government specifications canceled without replacement, and 1 duplicate military specification canceled, to

TABLE A-3
CONVERTED INSULATION SPECIFICATIONS

Canceled specification	Replacement specification
A-A-902 – Insulation, Thermal (Vermiculite)	ASTM C516 – Standard Specification for Vermiculite Loose Fill Thermal Insulation
A-A-903 – Insulation, Thermal (Expanded Perlite)	ASTM C549 – Standard Specification for Perlite Loose Fill Insulation
HH-I-515 – Insulation, Thermal (Loose Fill for Pneumatic or Poured Application): Cellulosic or Wood Fiber	ASTM C739 – Standard Specification for Cellulosic Fiber (Wood-Base) Loose Fill Thermal Insulation
HH-I-521 – Insulation Blankets, Thermal (Mineral Fiber, for Ambient Temperatures)	ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
HH-I-523 – Insulation Block and Pipe Covering Thermal (Calcium Silicate for Temperatures up to 1,200° F)	ASTM C533 – Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
HH-I-524 – Insulation Board, Thermal (Polystyrene)	ASTM C578 – Standard Specification for Preformed, Cellular, Polystyrene Thermal Insulation
HH-I-525 – Insulation Board, Thermal, Cork	ASTM C640 – Standard Specification for Corkboard and Cork Pipe Thermal Insulation
HH-I-526 – Insulation Board, Thermal (Mineral Fiber)	ASTM C726 – Standard Specification for Mineral and Mineral Fiber Roof Insulation Board
HH-I-527 – Insulation Board, Thermal (Building Board, High-strength, Sheathing)	ASTM C208 – Standard Specification for Insulating Board (Cellulosic Fiber), Structural and Decorative
HH-I-528 – Insulation Batts and Blankets, Thermal (Vegetable Fiber)	No replacement
HH-I-529 – Insulation Board, Thermal (Mineral Aggregate)	ASTM C728 – Standard Specification for Perlite Thermal Insulation Board
HH-I-530 – Insulation Board, Thermal, Unfaced Polyurethane or Polyisocyanurate	ASTM C591 – Standard Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation
HH-I-545 – Insulation, Thermal and Acoustical (Mineral Fiber, Duct Lining Material)	ASTM C1071 – Insulation, Thermal and Acoustical, (Mineral Fiber, Duct Lining Material), Standard Specification for
HH-I-551 – Insulation Block and Boards, Thermal (Cellular Glass)	ASTM C552 – Standard Specification for Cellular Glass Thermal Insulation
HH-I-573 – Insulation Sleeving, Thermal	ASTM C534 – Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form, Specification for
HH-I-574 – Insulation, Thermal (Perlite)	ASTM C549 – Standard Specification for Perlite Loose Fill Insulation
HH-I-585 – Insulation, Thermal (Vermiculite)	ASTM C516 – Standard Specification for Vermiculite Loose Fill Thermal Insulation
HH-I-1030 – Insulation, Thermal (Mineral Fiber, for Pneumatic or Poured Application)	ASTM C764 – Standard Specification for Mineral Fiber Loose Fill Thermal Insulation
HH-I-1252 – Insulation, Thermal, Reflective (Aluminum Foil)	No replacement
HH-I-1751 – Insulation Sleeving, Thermal (Pipe and Tube Covering)	No replacement

TABLE A-3
CONVERTED INSULATION SPECIFICATIONS (Continued)

Canceled specification	Replacement specification
HH-I-1972/6 – Insulation Board, Thermal, Polyurethane or Polyisocyanurate Faced with a Mineral Fiberboard on One Side of the Foam and a Glass Mat Facing on the Other Side of the Foam	No replacement
SS-C-160 – Cements, Insulation Thermal	ASTM C195 – Standard Specification for Mineral Fiber Thermal Insulating Cement ASTM C196 – Standard Specification for Expanded or Exfoliated Vermiculite Thermal Insulating Cement ASTM C449 – Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
LLL-I-535 – Insulation Board, Thermal (Cellulosic Fiber)	ASTM C208 – Standard Specification for Insulating Board (Cellulosic Fiber), Structural and Decorative
MIL-I-8776 – Insulation Blanket, Thermal, Aircraft Gas Turbine Engine	No replacement
MIL-I-15475 – Insulation Felt, Thermal, Fibrous Glass Semirigid	No replacement
MIL-B-19564 – Bedding Compound, Thermal Insulation Pipe Covering	No replacement
MIL-I-23128 – Insulation Blanket, Thermal, Refractory Fiber, Flexible	No replacement
MIL-I-46899 – Insulation, Sheet, Cork	No replacement
MIL-I-47047 – Insulation Stock, Thermal	No replacement
MIL-I-47198 – Insulation Material, Sheet Form, Glass Fiber, Neoprene Coated	No replacement
HH-B-100 – Barrier Material Vapor (for Pipe, Duct, and Equipment Thermal Insulation)	ASTM C1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
MIL-I-13042 – Insulation Sleeving, Thermal, Tubular, Flexible	A-A-52152 – Insulation Sleeving, Thermal, Tubular
MIL-I-52172 – Insulation Batt, Nylon, Thermal	No replacement

date by NAVFAC is \$38,461. The annual savings of \$90,016 cumulated over the 20-year expected life cycle of insulation standards is \$1.8M (FY91 dollars).

Currently, NAVFAC completes about \$550 million dollars of military construction (MILCON) projects each year that require thermal insulation. The insulation costs for those projects is about 10 percent of total mechanical costs, and the total mechanical costs are roughly 16 percent of total construction cost (*Means Building Construction Cost Data*, 1991, R.S. Means Company, Inc.) The use of NGSs for thermal insulation in construction contracts will save an estimated 2 percent in

TABLE A-4

INSULATION SPECIFICATIONS STANDARDIZATION LIFE-CYCLE COST ANALYSIS

Administrative costs:	
Average annual cost to maintain Government spec. for equip. life (5-year mandated review cycle)	\$ 2,959
Average annual cost to maintain NGS for equip. life	<u>376</u>
Average annual admin. savings from conversion to NGS	2,583
NPV of admin. cost savings	
Equipment/material costs:	
Purchase costs:	
Annual Navy construction requiring insulation	505,000,000
Annual other Federal Government construction requiring insulation	<u>13,203,000,000</u>
Total construction requiring insulation	13,708,000,000
Insulation costs as a percentage of construction costs	0.016
Purchase savings as a percentage of insulation costs	0.02
Annual Navy purchase savings	161,600
Annual other Federal Government purchase savings	<u>4,224,960</u>
Total annual purchase savings	4,386,560
Total savings:	
Annual admin. savings for 20 specs. converted to NGS	51,655
Annual admin. savings for 13 cancelled specs.	<u>38,461</u>
Total admin. savings over 20-year life-cycle	1,802,306
Navy purchase savings for 20 years	3,232,000
Other Fed. Govt. purchase savings for 20 years	84,499,200
Total life-cycle savings	\$ 89,533,506

Note: NPV = net present value.

insulation cost based on discussions with two major insulation manufacturers. Based on FY92-95 MILCON estimates, the average amount of Navy construction requiring insulation in the future is about \$505 million. Therefore, NAVFAC will spend an average of \$8.9 million dollars a year on insulation, and the savings incurred from using NGS on insulation results in an annual savings of \$160,800. Other Federal Government agencies spend about 26 times as much on insulation as

the Navy, and their savings are \$4,224,960 per year. Over the 20-year life cycle of the insulation specifications, the purchase savings to the Navy and other Federal Government agencies are \$3.2 million and \$84.5 million, respectively. The total life-cycle savings to the Government from insulations specification standards work completed to date by NAVFAC is therefore \$89.5 million.

Over the next several years, NAVFAC plans to cancel or convert the remaining 26 candidate Government insulation specifications. These conversions and cancellations will also result in significant budget savings for the Navy and the rest of the Federal Government.

APPENDIX B

CONVERSION TO INDUSTRY STANDARD VEHICLE PAINT SPECIFICATIONS RESULTS IN COST SAVINGS

CONVERSION TO INDUSTRY STANDARD VEHICLE PAINT SPECIFICATIONS RESULTS IN COST SAVINGS

PURPOSE

This case study summarizes the benefits associated with converting military paint specifications for commercially designed motor vehicles from nonindustry standard colors to a common industry standard.

BACKGROUND

The Navy purchases commercially designed motor vehicles and uses them for a variety of administrative, mission, and operational support functions. Many are special-purpose motor vehicles such as forklifts, cranes, and fire trucks. The majority, however, are general-purpose vehicles; the three types of vehicles falling into this category are passenger carrying motor vehicles, light trucks and vans, and trailers/truck tractors. The Department of the Navy owns 43,244 motor vehicles of this type (end of FY90). In addition, it leases 8,870 more from the General Services Administration (GSA) and has another 3,672 on commercial lease.

The Navy purchases its motor vehicles through GSA, as do the other Military Departments, and operates and maintains its own vehicles using its own personnel or contractors. DoD regulations require the Navy to replace its motor vehicles between 60,000 and 300,000 miles or every 6 to 12 years, depending on the vehicle type. The Navy disposes of its vehicles through the Defense Logistics Agency's Defense Reutilization and Marketing Service and receives no money for the vehicles.

The Navy has purchased an average of 1,843 (see Table B-1) general-purpose motor vehicles annually over the past 6 years. Its special purchase requirements (i.e., paint color - "battleship gray" for light trucks, vans, and tractor trailers and black for sedans) resulted in its paying more for the same type of vehicles purchased by GSA than other Federal agencies. Federal agencies are required by 40 U.S.C. 901 et seq., enacted on 7 April 1986, to reduce the cost and improve the efficiency of fleet operations by using the most cost-effective arrangement to acquire, operate, maintain, and dispose of motor vehicles.

TABLE B-1

GENERAL-PURPOSE MOTOR VEHICLE ACQUISITION SCHEDULE

ECC	Description	Equipment purchases					
		FY86	FY87	FY88	FY89	FY90	FY91
	Passenger Carrying Motor Vehicles						
0061	Bus, Motor, 20 Passenger	19	8	4	23	2	
0063	Bus, Motor, BOC, 36 Passenger	108	64	87	115	82	
0065	Bus, Motor, BOC, 44 Passenger	1		2	4	1	
0066	Bus, Ambulance, Conv FC	1	1			3	
0070	Bus, Motor, Intercity, 44 - 49 Passenger	7		1	2	1	
0103	Sedan, Subcompact	4		1			
0104	Sedan, Compact, 4 Door	457	238	120	124	374	
0114	Sedan, Police, Compact	50	38	54	19	39	
0210	Station Wagon, Compact	151	72	60	34	75	
	Subtotal	798	421	329	321	577	
	Light Trucks and Vans						
0305	Truck, 1/4 Ton, Utility	42	12	22	18	27	29
0308	Truck, 1/4 Ton, Postal	1	1	1			
0313	Truck, 1/2 Ton, Pickup	171	86	39	109	131	186
0316	Truck, 1/2 Ton, Pickup	21	13	16	111	10	25
0317	Truck, 1/2 Ton, Carryall	11	2	3	5	6	2
0319	Truck, Pickup, Compact	599	287	167	249	358	365
0320	Truck, Pickup, Compact	73	22	14	33		
0321	Truck, Pickup, Compact	27	18	4	11	10	5
0327	Truck, 3/4 Ton, Pickup	90	25	18	51	53	75
0329	Truck, Panel	83	35	9	116	76	79
0330	Truck, Van, FC	406	196	130	197	389	303
0331	Ambulance, Transport					36	
0332	Ambulance, Field, Commercial	29			5		
0333	Ambulance Conversion, Commercial FC	51	26	3	1	12	
0334	Truck, Ambulance, Modular Body		31	11	92	62	
0336	Truck, Panel, Paddy Wagon	25	9	8	6	7	10
0342	Truck, 1 Ton, Pickup	17	5	2	14	15	8
0343	Truck, 1 Ton, Stake	19	7	4	6	7	8
0345	Truck, 1 Ton, Step	21	13	16	31	40	12
0348	Truck, 1 Ton, Pickup	27	2	12	9	23	24

Note: ECC = equipment category code

TABLE B-1

GENERAL-PURPOSE MOTOR VEHICLE ACQUISITION SCHEDULE (Continued)

ECC	Description	Equipment purchases					
		FY86	FY87	FY88	FY89	FY90	FY91
	Light Trucks and Vans (Continued)						
0349	Truck, 1 Ton, Panel	1					
0350	Truck, 1 Ton, Carryall	8	8	3			
0355	Truck, 1 Ton, Pickup	19	11	7	19	8	10
0360	Truck, 1-1/4 Ton, Cargo				3		
0362	Truck, Van, High-Volume	17	12	12	7	19	14
0420	Truck, 1-1/2 Ton, Step	52	8	14	6	7	5
0443	Truck, 2 Ton, Dump	32	9				
0445	Truck, 2 Ton, Stake	95	29				
0449	Truck, 2 Ton, Van		11				
0456	Truck, 2 Ton, Dump		2				
0523	Truck, 2-1/2 Ton, Dump			4	16	16	5
0525	Truck, 2-1/2 Ton, Stake		4	41	41	79	49
0527	Truck, 2-1/2 Ton, Van	1	2	18	16	25	13
0528	Truck, 2-1/2 Ton, Stake						1
0582	Truck, 5 Ton, Stake			1			
0590	Truck, 5 Ton, Van, Refrigerator				1	6	6
0601	Truck, 5 Ton, C/C					2	
0603	Truck, 5 Ton, Stake	2		1			
0644	Truck, 15 Ton, Dump	1					
0701	Truck, Carrier, Amphibious			2	2		
0704	Truck, Ammunition Handling	9	1	2	7	2	5
0705	Truck, Airfield, Mobile Control Tower	2	3	3	4		
0707	Truck, Airfield Maintenance	23	1	4	7		
0708	Truck, Platform, Utility	28	30	1	15	3	7
0709	Truck, Field Service	3			1		1
0713	Truck, Tire Service						1
0722	Truck, Maintenance, Utility	114	65	54	94	43	77
0723	Truck, Pole & Line Maintenance	19	1	1	2		2
0725	Truck, Overhead, Maintenance			5	4	4	6
0728	Truck, Hazardous Spill			1	1		1
0730	Truck, Wrecker	3	3	2	2	7	3
0731	Truck, Loader, Aircraft	13	3	3	11		
0734	Carrier, Personnel	2					
0742	Truck, Tank, General Purpose	15					

Note: ECC = equipment category code

TABLE B-1

GENERAL-PURPOSE MOTOR VEHICLE ACQUISITION SCHEDULE (Continued)

ECC	Description	Equipment purchases					
		FY86	FY87	FY88	FY89	FY90	FY91
	Light Trucks and Vans (Continued)						
0743	Truck, Tank, Aviation Lube	4		3			
0746	Truck, Tank, 1.5K Fuel Servicing	1	5	5	7	11	5
0751	Truck, Tank, 2K Fuel Servicing		1		1		
0753	Truck, Tank, 3K General Purpose	2					
0756	Truck, Tank, Aviation Gas	2	12				
0758	Truck, Tank, Water Potable		1				
5820	Truck, Refuse	9		1	1	1	
5830	Truck, Material Handling, Chain Hoist/Haul			4	2		1
5833	Truck, Material Handling, Hoist/Haul		3	1	4		
5835	Truck, Refuse Collection		8	3	2	2	3
	Subtotal	2,190	1,023	675	1,340	1,497	1,346
	Trailers/Truck Tractors						
0090	Semi-Trailers w/Passenger Conversion	1	1				
0604	Truck, 5 Ton, Tractor	21	13	25	21		
0614	Truck, 7-1/2 Ton, Tractor					28	9
0616	Truck, 7-1/2 Ton, Tractor, Yard Spotter						1
0630	Truck, 10 Ton, Tractor	1	1				
0645	Truck, 15 Ton, Tractor		4				
0649	Truck, 25 Ton, Tractor						5
0800	Trailer, 1 Ton, Maintenance		1				
0802	Trailer, 3/4 Ton, Cargo	2					
0805	Trailer, 2 - 5 Ton, 2 - 4 WH	9	14	17			
0808	Trailer, Maintenance Platform	1					
0809	Trailer, Equipment EB	24	3	2		1	1
0812	Semi, 12 Ton, Stake	14	2	22	6	20	
0813	Semi, 12 Ton, Van	16	15				
0816	Semi, 20 Ton, Stake	3	21	1			6
0817	Semi, 20 Ton, Van			10	3	3	1
0822	Semi, 20 Ton, Lowbed		3	2	2	1	4
0825	Semi, 35 Ton, Lowbed			6	3	5	5
0826	Semi, 50 Ton, Lowbed	6		4		2	2

Note: ECC = equipment category code.

TABLE B-1

GENERAL-PURPOSE MOTOR VEHICLE ACQUISITION SCHEDULE (Continued)

ECC	Description	Equipment purchases					
		FY86	FY87	FY88	FY89	FY90	FY91
	Trailers/Truck Tractors (Continued)						
0828	Semi, 75 Ton, Lowbed						1
0832	Trailer, 6 Ton, Lowbed					1	
0842	Trailer, 13 Ton, Bolster			1			
0843	Trailer, 5 Ton, Cable Reel	2	1	3	1		
0845	Trailer, 1/4 Ton, CB SP			1			
0848	Trailer/Semi Dump	1		3	2		2
0862	Trailer, Tilt Deck	16	7	9	1	6	4
0881	Trailer, Tank, 500G	41	9	11		5	2
0888	Semi, Tank, 3000G		2				
0890	Semi, Tank, 5500G			6	2	3	
5840	Trailer, Refuse Collection		1				
5842	Semi, Refuse, Compaction	1		1	2		1
	Subtotal	159	98	124	43	75	44
	Total	3,147	1,542	1,128	1,704	2,149	1,390

Note: ECC = equipment category code.

PROBLEMS

Traditionally, the Navy required all light trucks, vans, and tractor trailers purchased to be painted medium Navy gray, under FED-STD-595, *Colors Used in Government Procurement*, Chip 16187, a nonindustry standard paint color; the Navy also required all sedans purchased to be painted black under FED-STD-595, Chip 17038. These specifications require special attention from the manufacturers, and GSA must develop separate invitations for bid, apart from those used to obtain GSA's fleet. Because of the special requirements, these vehicles are not part of GSA's volume purchase agreement with the major manufacturers.

The gray and black colors specified by the Navy for its motor vehicle purchases are not standard colors carried by any of the American automobile and truck manufacturers. Therefore, whenever the Navy purchases these motor vehicles, the

manufacturers are required to order and purchase the Navy's special color for painting the vehicles before delivery. This process adds to the cost of the vehicles purchased and these special acquisitions add to the administrative procurement costs.

Furthermore, the gray, nonindustry standard, paint required by the Navy was a poorer quality paint, requiring more frequent maintenance and higher maintenance costs.

DISCUSSION

The Navy's special paint does not serve an intrinsically military purpose nor is its mission essential. The additional costs incurred in acquiring and maintaining the special vehicle paint without a mission requirement is unnecessary and wasteful. When a commercial product is available that does not conflict with the requirements of the activity, it should be used. The Navy's special paint requirements are opposed to the Defense Standardization Program's objectives of enhancing maintainability of military equipment and assuring that specifications are tailored to reflect only particular needs consistent with mission requirements.

OUTCOME

The Civil Engineer Support Office (CESO) is responsible for managing the acquisition of all motor vehicles for the Navy. In 1979, CESO requested that the Naval Facilities Engineering Command (NAVFAC) change its policy of requiring nonindustry standard paint colors for its motor vehicle fleet, citing the excess costs of purchasing and maintaining the unique Navy paint colors. CESO researched the various paint colors that were standard to each American automobile manufacturer and determined that Pure White was the only one that was standard to all manufacturers. NAVFAC concurred with the CESO recommendations and has since purchased vehicles with the industry standard Pure White paint color available from all three major American automobile manufacturers.

PAYOFFS

The dollar savings of buying a commercially available industry standard paint color on Navy vehicles versus buying the unique nonindustry standard paint is significant. The General Accounting Office recently completed a study of the cost of

military motor vehicles that estimated the difference in initial purchase cost to be an average of \$100 per vehicle (FY91 dollars)¹. Over the past 6 years, the Navy has purchased an average of 1,843 general purpose motor vehicles annually for commercial purposes. Therefore, the annual savings from the change to the industry standard paint color is \$184,300. Over a 20-year period, this results in a \$3,686,000 (FY91 dollars) total savings to the Government from eliminating the Navy's specification for a nonindustry standard paint color for general purpose motor vehicles.

¹General Accounting Office, Report GAO/NSIAD-91-132, *Motor Vehicles: Better Management of the Military Services' Vehicles Could Save Millions*, May 1991.

APPENDIX C

**PURCHASE OF COMMERCIAL FIRE TRUCKS RESULTS IN
SIGNIFICANT COST SAVINGS**

PURCHASE OF COMMERCIAL FIRE TRUCKS RESULTS IN SIGNIFICANT COST SAVINGS

PURPOSE

This case study summarizes the benefits associated with purchasing commercially designed aircraft crash fire/rescue trucks rather than trucks built to military specification.

BACKGROUND

The Navy requires fire trucks at its shore installations for a variety of firefighting, crash, rescue, and other related functions. The type of vehicle discussed in this study is an aircraft crash fire/rescue truck with a 3,000-gallon water capacity. The Navy has a requirement to replace the trucks at its Naval Air Stations, most of which are about 25 years old. Those trucks require significant maintenance because of their age. In addition, since many parts are no longer available, many repairs require the fabrication of custom made parts. Thus, some repairs can take up to several months. For example, one of these trucks recently suffered a broken axle, the axle had to be custom made, and the truck was out of commission for several months.

The Air Force (Warner Robins Air Logistics Center) prepares and maintains the military specification for crash fire/rescue trucks. That specification, MIL-T-27213, describes a diesel-driven, crash fire/rescue truck with a 3,000-gallon water capacity. The specification was revised by the Air Force in 1988 as part of its program to purchase new trucks of this type for most of its airfields. The Navy had planned to participate in the Air Force buy of these vehicles to meet its own requirements for crash fire/rescue trucks at Naval Air Stations. However, the Navy ultimately decided not to participate in the Air Force procurement, and to instead purchase a commercial "off-the-shelf" version of this truck.

PROBLEMS

After studying the mission requirements for crash fire/rescue trucks at Naval Air Stations, the Naval Facilities Engineering Command (NAVFAC) determined that the requirement could be satisfied by commercially designed vehicles. NAVFAC

concluded that use of military specification MIL-T-27213 to procure the trucks would result in a vehicle designed specifically for the military at a significantly increased cost without a corresponding significant increase in needed functionality. In addition, vehicles designed specifically for the military would lead to higher maintenance costs over the life of the trucks because of special orders and/or custom design of parts.

DISCUSSION

The additional costs incurred in acquiring and maintaining crash fire/rescue trucks under a military specification without a mission requirement is unnecessary and wasteful. By purchasing products that have been "tested" in the commercial marketplace, a contracting officer is freed from many of the quality concerns that he faces when he purchases a product from a vendor who has never sold the product before. Thus, limiting the procurement to a "commercial" product precludes the need for describing the Government's requirements in a detailed military specification. Procurement of crash fire/rescue trucks under the military specification would be in opposition to the Defense Standardization Program's objectives of enhancing maintainability of military equipment and assuring that specifications are tailored to reflect only particular needs consistent with mission requirements.

OUTCOME

In 1989, NAVFAC decided not to purchase military crash fire/rescue trucks under the pending Air Force procurement. Instead, it wrote a purchase description (PD4210-1532-90-01) for a diesel-engine-driven, 3,000-gallon minimum capacity crash fire/rescue truck that can be commercially designed and will meet the Navy's needs. The Navy's purchase description references the essential component military and Federal specifications and standards needed in the vehicles. Most of these specifications and standards are also referenced in the Air Force's military specification. NAVFAC is currently developing a military specification, MIL-T-28571, from the purchase description for its crash fire/rescue trucks. The primary differences between the Air Force truck and the Navy truck are the self-deflating and self-inflating capability of the Air Force truck tires when the vehicle switches from on-road to off-road and back again, and independent suspension.

Using the purchase description, NAVFAC issued an invitation for bids and has awarded a contract for commercially designed crash fire/rescue trucks. The contract calls for a base purchase of 16 vehicles and an option for 16 more (the Air Force buy under the military specification is for 200 base vehicles and 88 option vehicles). A picture of the Navy-purchased vehicle is attached.

PAYOFFS

No administrative cost savings will be realized because the Air Force, not the Navy, maintains the military specification for crash fire/rescue trucks. However, the dollar savings of buying commercially designed vehicles instead of those described in the military specification are significant. The differences in prices, based on the Air Force procurement, and the total savings is shown in Table C-1. The per unit savings on trucks purchased in the base contract is \$177,000 (FY91 dollars). For the 16 vehicles to be purchased in the base contract, that represents a savings of more than \$2.8 million. For the 16 vehicles to be purchased under the option, the savings are \$144,000 per truck for a total of \$2.3 million (FY91 dollars). Therefore, the total savings to the Government from purchasing 32 commercially designed crash fire/rescue trucks for Naval Air Stations is approximately \$5.1 million.

TABLE C-1
SAVINGS FROM BUYING COMMERCIALY DESIGNED
CRASH FIRE/RESCUE TRUCKS
(FY91 dollars)

	Base contract	Option	Total savings
Quantity	16	16	
Air Force unit price	456,607	422,656	
Navy unit price	279,128	278,547	
Unit savings	177,479	144,109	
Total savings	2,839,664	2,305,744	5,145,408



APPENDIX D

**PURCHASE OF COMMERCIAL VERSUS TACTICAL
CONSTRUCTION EQUIPMENT FOR SEABEES RESULTS
IN SIGNIFICANT COST SAVINGS**

PURCHASE OF COMMERCIAL VERSUS TACTICAL CONSTRUCTION EQUIPMENT FOR SEABEES RESULTS IN SIGNIFICANT COST SAVINGS

PURPOSE

This case study summarizes the benefits associated with converting from the purchase of tactical to commercial construction equipment for Naval Mobile Construction Battalions (NMCBs).

BACKGROUND

Prior to World War II, the Navy relied exclusively on the services of contractors and their civilian employees for naval construction projects overseas. However, these civilians could not work in combat zones. At the beginning of World War II, the Navy created its own uniformed construction force – the Seabees – to serve under officers of the Civil Engineer Corps. A construction battalion consists of a headquarters company and four construction companies, with all the necessary skills for any construction job. The primary function of Seabees is to construct advance bases, typically inland after the establishment of a beachhead by the Marines, possibly including piers, docks and airstrips. Currently, the Navy has 8 active and 17 reserve NMCBs.

Each NMCB has an allowance of equipment to perform its mission. This allowance is designated as the Advance Base Functional Component P-25. Equipment to maintain the allowance is procured by the Naval Facilities Engineering Command (NAVFAC) through its Civil Engineer Support Office. A major portion of that allowance is the Civil Engineering Support Equipment (CESE) component, described in Table D-1. Until the mid-1980s many of the items in the P-25 CESE component were purchased as tactical, instead of commercial, equipment. The reasoning was that only tactical equipment could satisfy the Seabee's mission.

PROBLEMS

Tactical construction equipment has been more expensive to purchase and maintain than commercial construction equipment. The added specifications

TABLE D-1
COMMERCIAL P-25 CESE COMPONENTS

ECC	Item description	Quantity	Unit price (\$)	Total (\$)
0361-31	Truck, Ambulance, Field Commercial, 4x4, Ded, Automatic Transmission, 4 Liter, with Diss Vacuum Outlet, One Rotating Warning Light, Electronic Siren and PA System, Heating and Air Conditioning, 10,000 GVW Specification: MIL-T-14382	2	31,569	63,138
0643-01	Truck, Stake, 6x6, Ded, Automatic Transmission, ISO Container Locks, Troop Seats and Bed Cover, Air Transportable C-130, 20 Ft. Bed, 46,000 GVW (15T Stake Truck) Specification: KKK-T-2111	20	61,986	1,239,720
0644-02	Truck, Dump, 6x6, Automatic Transmission, 10 Cu Yd, Hydraulic Hoisted Dump Body, Cab Protector, Air Transportable C-130, 46,000 GVW (15T Dump Truck) Specification: KKK-T-2111	16	72,292	1,156,672
0709-21	Truck, Lube and Fuel Servicing, 4x4, Ded, Automatic Transmission, Three 55 Gal. Drums, One 120 Lb. Drum, Diesel and Gas Tank, 7 Hose Reels, 30 Gal. Water Tank, Air Compressor, Air Transportable C-130, 24,000 GVW Specification: MIL-T-82073	2	77,128	154,256
0730-21	Truck, Wrecker, 6x6, Ded, Automatic Transmission, 25 Ton, Front and Rear Winch, Air Transportable C-130, 46,000 GVW Specification: KKK-T-2109	2	103,639	207,278
0307-31	Truck, Utility, Commercial 4x4, Ded, Automatic Transmission, Metal or Fiberglass Top, 24 Volt Radio Outlet, 5,400 GVW (3/4T Utility Truck) Specification: FED-STD-292	12	21,128	253,536
0360-31	Truck, Cargo, Commercial, 4x4, Ded, Automatic Transmission, 24 Volt Radio Outlet, 8,500 GVW (1-1/4T Cargo Truck) Specification: FED-STD-292	16	15,520	248,320
0645-12	Truck, Tractor, 6x6, Ded, Automatic Transmission, Sliding Fifth Wheel, Air Transportable C-130, 46,000 GVW (15T Tractor Truck) Specification: KKK-T-2111	6	64,058	384,348
0645-21	Truck, Tractor, 6x6, Ded, Automatic Transmission, Fifth Wheel Height 55 in. (plus or minus 1 in.), 60,000 GVW (20T Tractor Truck) Specification: KKK-T-2111	4	86,578	346,312

TABLE D-1
COMMERCIAL P-25 CESE COMPONENTS (Continued)

ECC	Item description	Quantity	Unit price (\$)	Total (\$)
0825-11	Semitrailer, Lowbed, 35 Ton, 3 Axle, Fixed Gooseneck, Level Deck w/Swing-out One-foot Extenders, Folding Loading Ramps, 12/24 Volt Electric System, Lift and Tiedown Attachments, 70,000 Lb. Payload, Air Transportable C-130 (35T Semi Lowbed) Specification: MIL-S-45152	13	19,996	259,948
4350-01	Excavator, Crawler Mounted, Ded Hydraulically Operated, Revolving Upper Structure, Backhoe Type Boom, 36 and 48 in. General Purpose Buckets, Quick Disconnect, Hydraulic Hammer-Pavement Breaker, Front, Rear, and Boom Mounted Work Lights Specification: MIL-E-29239	2	103,863	207,726
4420-21	Grader, Road, Motorized, Ded, 6x4, Open Canopy, Rollover Protection Structure, w/Scarifier, 12 Ft Blade (Type II, Size 4) Specification: OO-G-630	6	61,189	367,134
4530-41	Loader, Scoop Type, Full Tracked, Ded, 2-1/2 Cu Yd 140 FWHP, Multipurpose Bucket, w/Power Shift, Cab Open Canopy, w/o Winch Specification: KKK-L-1086	4	69,652	278,608
4531-10	Loader, Wheel Mounted, Ded, 2 Cu Yd Multipurpose Bucket, Four Wheel Drive, Articulated Steering, Front Mounted Backhoe, Forks, Boom Extension, Removable Open Rops Canopy Specification: KKK-L-1542	3	73,001	219,003
4531-30	Loader, Wheel, Ded, 125 HP min., Multipurpose Bucket, Articulated Frame, Quick Disconnect, Forks, Adjustable Boom, Front Mounted Backhoe, Removable Open Rops Canopy Specification: KKK-L-1542	3	80,012	240,036
4635-20	Roller, Motorized, Vibratory Compactor, Front Drum Drive, Rear Wheel Drive, Smooth Drum and Sheepfoot Drum, Removable Open Rops Canopy Specification: MIL-R-28567	3	60,152	180,456
4750-10	Scraper, Tractor, Ded, Earthmoving, 4x2, Single Engine, 12 Cu Yd Heaped Capacity, Removable Open Rops Canopy Specification: MIL-S-28632	8	125,489	1,003,912

TABLE D-1
COMMERCIAL P-25 CESE COMPONENTS (Continued)

ECC	Item description	Quantity	Unit price (\$)	Total (\$)
4830-10	Tractor, Crawler, Size T-5, Straight Blade, Hydraulically Raised and Lowered w/Hydraulic Angle and Tilt, Rear Winch, Removable Open Rops Canopy Specification: KKK-T-631	2	93,864	187,728
2433-01	Mixer, Concrete, 11 Cu Ft, Portable, Wheel Mounted, Ded, End Delivery, Air Transportable Specification: MIL-M-686	2	15,951	31,902
2520-12	Distributor, Asphalt, 2,000 Gal., 4 Ft. to 24 Ft. Spraying Width, Truck Mounted, 6x6, Wide Base Wheels and Tires, Ded, Hydrostatically Driven 375 GPM Asphalt Pump Capable of Pumping and Distributing Asphalt, Cutback Asphalt, Emulsified Asphalt, and Tar Specification: MIL-D-575	1	102,202	102,202
2521-05	Distributor, Water, 2,000 Gal., Truck Mounted, 6x6, Ded, Wide Base Wheels and Tires, Commercial Chassis, Hydrostatically Driven 465 GPM Water Pump, 2 Spray Heads Front, 2 Spray Heads Rear, Each Spray Head Individually Controlled, Air Transportable Specification: MIL-D-28531	6	96,421	578,526
3135-02	Compressor, Air, Rotary, 250 CFM at 100 PSIG, Ded, Wheel Mounted, 4 Wheels, 2 Axles in Tandem, Fixed Tongue with Adjustable Lunette Hitch, Air Transportable Specification: MIL-C-82086	4	10,463	41,852
3165-02	Compressor, Air, Rotary, 750 CFM at 100 PSIG, Ded, Wheel Mounted, 4 Wheels, 2 Axles in Tandem, Fixed Tongue with Adjustable Lunette Hitch, Air Transportable Specification: MIL-C-82086	1	29,179	29,179
3165-11	Compressor, Air, Rotary, 750 CFM at 300 PSIG, Ded, Wheel Mounted, 4 Wheels, 2 Axles in Tandem, Fixed Tongue with Adjustable Lunette Hitch, Air Transportable Specification: MIL-C-82086	1	57,980	57,980
3710-02	Auger, Earth, Truck Mounted with Turntable Base, Ded, Hydraulic, with Hydrostatic Drive, 10 Ft. Depth Boring Capacity, with one each 8 in., 12 in., 18 in., 24 in. Auger Bits, with Pole Setting Attachment, Winch, and Collapsible Wire Reel, Commercial Truck Chassis, 4x4, Ded, Wide Base Wheels and Tires Specification: MIL-A-516	2	130,703	261,406

TABLE D-1
COMMERCIAL P-25 CESE COMPONENTS (Continued)

ECC	Item description	Quantity	Unit price (\$)	Total (\$)
5121-15	Generator Set, Tactical Quiet, Ded, Skid Mounted, 15KW, AC, 120/208 V, 3 Phase, 4 Wire, 50-60 Hz, MEP 804A Specification: PD-6115-0044	4	9,311	37,244
5122-30	Generator Set, Tactical Quiet, Ded, Skid Mounted, 30KW, AC, 120/208/240/416 V, 3 Phase, 4 Wire, 60 Hz, MEP 805A Specification: PD-6115-0044	3	10,762	32,286
5900-01	Saw, Radial, Overarm, Woodworking, Shop, 16 inch, w/Diesel-Electric Generator, Wheel Mounted Specification: MIL-S-17717	4	15,847	63,388
8215-01	Crane, Truck Mounted, 2 Engine, Lattice Boom, 35 Ton Capacity, Minimum 60 Ft. Boom and 20 Ft. Jib. Specification: MIL-C-22972	2	329,865	659,730
8254-25	Crane, Wheel-Mounted, 4x2, Ded, 14 Ton Specification: MIL-C-28614	5	198,261	991,305
1820-04	Truck Forklift 4,000 Lb. Pneumatic Tire Military Specification: SPCC-PD-500	5	42,390	211,950
1820-12	Truck Forklift 10-12,000 Lb. Ded Pneumatic Tire Military Rough Terrain Specification:	7	88,466	619,262
	Total			10,716,343

necessary to meet tactical requirements added significantly to initial purchase costs and the cost of replacement and repair parts. In addition, procurement delays in obtaining tactical construction equipment caused problems in maintaining P-25 CESE component allowances at desired quantity/quality levels.

The CESE component of the P-25 allowance is construction equipment for constructing advance bases. All of the items of that component are commercially available and are used extensively by shore activities for other construction purposes.

With few exceptions, the commercially available equipment has been determined satisfactory for the P-25 CESE component requirements for the Seabees.

DISCUSSION

The additional costs incurred in acquiring and maintaining tactical construction equipment for a mission suitable for commercial equipment is unnecessary and wasteful. Procurement of tactical equipment that can be satisfied by commercial equipment is in opposition to the Defense Standardization Program's objectives of ensuring that military equipment is tailored to reflect only particular needs consistent with mission requirements.

OUTCOME

In 1984, NAVFAC made a policy decision that the CESE component of the P-25 allowance should be all commercial equipment with a few exceptions. That policy was established because although P-25 CESE components are used for a military mission, that mission can be satisfied using commercial equipment. Since that time, items in the P-25 CESE component have been purchased commercially. Applicable military specifications and standards apply as necessary (see Table D-1). Many of these commercial items will be procured on General Services Administration (GSA) multischedule contracts in the future, as GSA continues to develop more equipment lines.

PAYOFFS

The dollar savings of buying commercial, instead of tactical, construction equipment are significant. Because NAVFAC does not procure all P-25 CESE components at one time and because the equipment has a relatively long useful life, we cannot show actual savings to date for total P-25 CESE components. However, the magnitude of the savings for five important items (trucks) in the P-25 CESE component is shown in Table D-2. These figures demonstrate that the Navy has saved over \$4 million (FY91 dollars) in FY87 through FY91 on the purchase of just these five items in the P-25 CESE component, which is almost half the cost of an entire P-25 CESE allowance. In addition, in four of the five categories, the capacity of the commercial vehicles is at least triple that of the tactical vehicles. The purchasing of commercial construction equipment instead of tactical construction equipment for

the Seabees will continue to save the Government millions of dollars and provide greater capacities.

TABLE D-2
SAVINGS FROM PURCHASING COMMERCIAL
VERSUS TACTICAL CONSTRUCTION EQUIPMENT FOR SEABEES
(FY91 dollars)

ECC: Tactical/ commercial	Description	Price^a (\$)	Quantity purchased FY87 - FY91	Savings^b (\$)
0587-12 0644-02	5 ton dump truck 15 ton dump truck	86,063 70,276	56	884,100
0588-12 0643-01	5 ton cargo truck 15 ton stake truck	78,814 68,631	85	865,594
0607-12 0645-12	5 ton tractor truck 15 ton tractor truck	78,927 66,525	79	979,740
0730-12 0730-21	5 ton wrecker truck 25 ton wrecker truck	164,214 101,678	16	1,000,587
M-915 (Army) 0645-21	Tactical tractor truck 20 ton tractor truck	119,597 81,576	9	342,190
Total				4,072,210

^a Commercial prices are the average for all units purchased between FY87 and FY91.

^b Savings figures may not add due to rounding.

APPENDIX E

PURCHASE OF COMMERCIAL VERSUS NONSTANDARD EXCAVATORS FOR NAVAL MOBILE CONSTRUCTION BATTALIONS RESULTS IN COST SAVINGS

PURCHASE OF COMMERCIAL VERSUS NONSTANDARD EXCAVATORS FOR NAVAL MOBILE CONSTRUCTION BATTALIONS RESULTS IN COST SAVINGS

PURPOSE

This case study summarizes the benefits associated with purchasing standard commercial excavators rather than special excavators for Naval Mobile Construction Battalions (NMCBs).

BACKGROUND

Prior to World War II, the Navy relied exclusively on the services of contractors and their civilian employees for naval construction projects overseas. However, these civilians could not work in combat zones. At the beginning of World War II, the Navy created its own uniformed construction force – the Seabees – to serve under officers of the Civil Engineer Corps. A construction battalion consists of a headquarters company and four construction companies with all the necessary skills for any construction job. The primary function of Seabees is to construct advance bases, typically inland after the establishment of a beachhead by the Marines, possibly including piers, docks, and airstrips. Currently, the Navy has 8 active and 17 reserve NMCBs.

Each NMCB has an allowance of equipment to perform its mission. That allowance is designated as the Advance Base Functional Component P-25. Equipment to maintain the allowance is procured by the Naval Facilities Engineering Command (NAVFAC) through its Civil Engineer Support Office. A major portion of that allowance is the Civil Engineering Support Equipment (CESE) component.

Each P-25 CESE component has an allowance of two excavators. Of the three basic types of excavators, one type is mounted on a truck and has not been procured for NMCBs and the other two types are self-propelled by a diesel engine and roll on either inflatable tires (i.e., tire-mounted) or tracks (i.e., crawler-mounted). All three types have a revolving upper structure, a backhoe-type boom, general-purpose buckets, a hydraulic hammer-pavement breaker, and mounted work lights.

Excavators are used by the Seabees for a variety of purposes including excavation, grading, road repair, and rapid runway repair.

Traditionally, Seabees preferred the crawler-mounted excavator. In the mid-1980s, NAVFAC decided to switch to the tire-mounted version, which it believed would provide more versatility in certain situations. For example, when performing rapid runway repair (e.g., after bomb damage to a runway), the tire-mounted excavator would not damage runway surfaces because it would not have metal tracks. In addition, the tire-mounted version would eliminate the need for a tractor and trailer to transport the equipment.

At the same time, the Air Force was also in the process of procuring a tire-mounted excavator. The Air Force procurement description (PD) called for an all-terrain, all-wheel (e.g., six) drive excavator with a special steel undercarriage. The Air Force did not plan to buy all of the option units in its contract. The Navy initially planned to participate in the Air Force procurement since the Navy did not have either a PD or a military specification for a tire-mounted excavator.

PROBLEMS

The excavator the Air Force was purchasing called for special modifications to the commercial tire-mounted version. One such modification was all-wheel drive and another was a specially constructed, all-terrain, undercarriage that had to be manufactured by a company other than the manufacturer of the excavator. These two items, especially the all-terrain undercarriage, added significantly to the cost of the equipment and to the procurement time and were expected to increase operation and maintenance costs of the equipment. NAVFAC subsequently determined that the Seabees did not have a mission requirement for either all-wheel drive or all-terrain undercarriage as part of their excavators.

DISCUSSION

The additional costs that would have been incurred in acquiring specially designed and constructed excavators for a mission suitable for commercial equipment would have been unnecessary and wasteful. Procurement of such special equipment for a need that can be satisfied by standard commercial equipment is antithetical to the Defense Standardization Program's objectives of ensuring that military

equipment is tailored to reflect only particular needs consistent with mission requirements.

OUTCOME

NAVFAC did not participate in the Air Force procurement; rather, it wrote its own procurement description (PD-3805-1564V-86-28) for a standard commercial tire-mounted excavator. The PD has since been converted to a military specification (MIL-E-29249, *Excavator, Multipurpose, Wheel-Undercarriage, Diesel-Engine-Driven*) for general procurement use. The Equipment Category Code (ECC) of the unit in the P-25 CESE component is 4340-01. Excavators of this type were procured for Seabee use and satisfactorily met their mission requirements. The Seabees have recently reverted to crawler-mounted excavators as the prime piece of equipment in their allowance (ECC 4350-01), and the tire-mounted version is substituted from inventory when the crawler-mounted version is not in stock. In both the crawler- and tire-mounted cases, standard commercial versions are procured by NAVFAC, as opposed to the specially designed and constructed all-terrain excavator.

PAYOFFS

The savings for buying commercial excavators instead of specially designed and manufactured excavators are significant (see Table E-1). From FY88 to the present, NAVFAC has saved approximately \$1 million (FY91 dollars) on this one item.

TABLE E-1
SAVINGS FROM PURCHASING STANDARD COMMERCIAL EXCAVATORS
(FY91 dollars)

Excavator type	Unit price (\$)	Quantity	Unit savings (\$)	Total savings (\$)
Air Force Special all-terrain	141,610	N/A	N/A	N/A
Navy Commercial tire-mounted	117,163	22	24,447	537,825
Commercial crawler-mounted	109,545	14	32,065	448,908
Total savings				986,733

APPENDIX F

NAVY REAPS SIGNIFICANT COST SAVINGS BY DEVELOPING SPECIFICATIONS FOR NONTACTICAL FLOODLIGHT SETS

NAVY REAPS SIGNIFICANT COST SAVINGS BY DEVELOPING SPECIFICATIONS FOR NONTACTICAL FLOODLIGHT SETS

PURPOSE

This case study summarizes the benefits associated with defining military specifications for floodlight sets that meet the Navy's nontactical needs and can be procured commercially "off-the-shelf."

BACKGROUND

During the Vietnam Conflict, many tactical field units found that they could not borrow replacement equipment or generator sets from other Services because the equipment or sets were not compatible. To eliminate that problem, DoD Directive (DoDD) 4120.11, *Standardization of Mobile Electric Power Generating Sources*, created the Mobile Electric Power (MEP) program under the Secretary of the Army. Under the MEP program, each Service is required to purchase all its mobile generators from a prescribed family of generators. The directive covers all mobile generators [including those used at installations in the continental U.S. (CONUS)] and other nontactical needs. Since floodlight sets include generators as a major component, they were enveloped by the MEP directive although floodlight sets are not used for tactical purposes.

Floodlight sets are used by 8 active and 17 reserve Naval Mobile Construction Battalions (Seabees), and by Public Works Departments at Naval shore installations. When deployed in tactical situations, Seabee units use tactical, quiet, MEP generators for military reasons.

PROBLEMS

The MEP initiative has benefited the Navy and the other Military Departments by ensuring compatibility of generators for tactical needs. However, commercial portable floodlight sets can meet nontactical needs at construction sites and Naval shore installations. To meet DoDD 4120.11, the Navy had to purchase generators for the floodlight sets through the MEP program because they were powered by a mobile generator. In the early 1980s, procurement orders for MEP generators were placed

with the Army, but no generators were forthcoming. The Army advised the Navy that it would take 16 to 24 months to receive the generators. Once the generators arrived, work would still be required to assemble portable trailer-mounted floodlight sets. However, floodlight sets that would meet the Navy's nontactical needs were commercially available, fully assembled but without MEP generators; thus, they could not be purchased according to DoDD 4120.11 without a waiver. Most recently, the Naval Facilities Engineering Command (NAVFAC) has lost more than \$1 million in appropriation expirations because of procurement delays for MEP generators.

DISCUSSION

Naval shore installations, particularly those in CONUS do not have a mission requirement for MEP generators, nor are those installations required to have generators compatible with generators of the other Military Departments. The MEP generators are tactically quiet and designed for military field use. The Naval shore installations do not need tactically quiet generators nor do they need to be overly concerned with interchangeability of generators and equipment when the generators are being used solely for a commercially compatible function. In addition, the Seabees also use commercial floodlight sets (without MEP generators).

The additional costs incurred in acquiring and maintaining tactical equipment for commercial purposes is unnecessary and wasteful. When a commercial product is available that does not conflict with the requirements of the activity, it should be used. The purchase of MEP generators for nonmission requirement use is in opposition to the Defense Standardization Program's objectives of enhancing maintainability of military equipment and assuring that specifications are tailored to reflect only particular needs consistent with mission requirements.

OUTCOME

In 1984, NAVFAC wrote military specification MIL-F-29161 to match commercially available floodlight sets that suited the Navy's nontactical needs for the Seabees and shore installations because it was unable to make a timely procurement of MEP generators for use in assembling mobile floodlight sets. The specification describes an electric, diesel-engine-driven, trailer mounted floodlight set.

The specification is used by NAVFAC to purchase commercially available floodlight sets for the Seabees and Public Works Departments at shore installations. Floodlight sets for these nontactical uses are now purchased at significantly reduced costs and without the delays created by the MEP program.

PAYOFFS

The greatest payoff to the Navy, albeit the least quantifiable, is the timely procurement of a much needed piece of equipment. The floodlight sets are needed to allow for work where natural light is poor or nonexistent. Construction, repair, and maintenance can now continue without regard to the time of day and the amount of natural light at the worksite.

The dollar savings of buying a commercially available floodlight set versus assembling one from separately purchased pieces is significant. The last procurement for a MEP generator similar to the one included in a floodlight set cost \$9,548 (FY91 dollars). The costs of luminaries, telescoping tower and mast, ballast, connecting wiring, and a half-day's labor to construct the floodlight set is an additional \$4,071.

Alternatively, the comparable commercial floodlight set (6 KV, 4 luminaries/1000 W) cost \$10,850 (FY91 dollars) per unit. The purchase cost savings is, therefore, \$2,769. The Navy purchases an average of about 25 floodlight sets (for Seabees and shore installations) per year. The average annual purchase savings is \$69,225 (FY91 dollars). Of course, NAVFAC must maintain the military specification for commercial floodlight sets at an average annual cost of \$3,000, bringing the total net annual savings to \$66,225. Over a 20-year period, this results in a \$1,324,500 savings to the Government.

APPENDIX G

**TRISERVICE STANDARDIZATION OF POWER DISTRIBUTION
PANELS CREATES MANY OPERATIONAL AND COST BENEFITS**

TRISERVICE STANDARDIZATION OF POWER DISTRIBUTION PANELS CREATES MANY OPERATIONAL AND COST BENEFITS

PURPOSE

This case study discusses the benefits of integrating the Army, Navy, and Air Force requirements for power distribution panels (PDPs) into a single set of standard specifications.

BACKGROUND

Power distribution panels help to distribute remotely generated power for field installations that require heavy loads and circuit protection. A standard mobile electric power (MEP) generator supplies power, and a PDP distributes that power through cables to load centers that support mobile fleet hospitals, and communication and field tactical support facilities. The safe and efficient distribution of high levels of electrical power from MEP generators requires panels that will distribute the load currents to the load branches, provide proper fault protection for the load wiring, and ensure personnel protection. In developing PDPs, major consideration must be devoted to adverse environments in which humidity, temperature, and salt atmospheres can deteriorate the protective devices and affect operating limits. Consideration must also be given to installing the PDPs at remote installation sites without easy access.

PROBLEMS

Beginning with the Vietnam Conflict, the escalating development of remote, military-support complexes increased the demand for power systems that can effectively handle intricate load requirements. To meet individualized needs, each Military Department developed standards for an MEP generator family and associated PDPs that addressed its own needs. The result was PDPs that were not interchangeable because of differences in connectors, circuits, and power levels.

OUTCOME

In FY80, the Naval Facilities Engineering Command (NAVFAC) developed a family of PDPs and associated interconnecting distribution cabling specifications

(MIL-P-29183 and MIL-C-29184). Those specifications included nine different configurations from 10 kw to 400 kw load ratings with capacities up to 1,200 amperes. In addition, the specifications covered 13 different cabling configurations that were compatible with input/output connections. In FY85, new Navy fleet hospital requirements necessitated the creation of three more configurations.

Also in FY85, all the Military Departments recognized the need for a standardized family of PDPs and formed a committee to address the problem. Because the Navy's standardized family of PDPs and cable was already operational with developed hardware, and met virtually all the Services' requirements, the committee selected NAVFAC's military specifications as the basis for the PDP family. An additional two "slash sheets" were developed and added to MIL-P-29183 to meet unique Army requirements.

The Department of Defense (DoD) is currently using these specifications to meet all PDP procurement needs. The standardized systems can easily be installed and distribute power to networks tailored to individual requirements. NAVFAC continues to maintain the military specifications and standards for PDPs for DoD.

PAYOFFS

The Army and Air Force each save about \$6,000 a year in administrative costs because they no longer need to maintain separate PDP specifications and standards. Other, nonquantifiable, benefits resulted from the PDP standardization. For example, product qualification and production testing and attendant reports, data submissions, and quality recertification testing have been minimized.

The savings in purchase costs are heavily influenced by the quantity purchased because, until FY91, PDPs were purchased by competitive bid through the Defense Logistics Agency. (PDPs are now purchased directly from UNICOR, a federal prison manufacturing operation.)

Between FY87 and FY90, NAVFAC purchased 150 kw PDPs (MIL-P-29183/4) on three separate occasions at three different prices, as shown in Table G-1. The standardization of PDPs made these types of quantity purchases for DoD possible.

TABLE G-1
FY91 CONSTANT DOLLARS

Quantity	Unit price (\$)	Percent savings (%)
6	14,627	-
14	9,908	32
20	8,074	45

We expect the savings from PDP standardization to continue under the purchase contracts with UNICOR. The prices quoted from UNICOR thus far are competitive with private industry large quantity prices. Further, UNICOR prices are the same for all quantities purchased. Therefore, the benefits of standardized power distribution panels will continue to accrue to all Military Departments.

APPENDIX H

REVISION AND DEVELOPMENT OF MILITARY SPECIFICATIONS FOR BOILERS REAPS BENEFITS FOR THE NAVY'S PROCUREMENT PROCESS

REVISION AND DEVELOPMENT OF MILITARY SPECIFICATIONS FOR BOILERS REAPS BENEFITS FOR THE NAVY'S PROCUREMENT PROCESS

PURPOSE

This case study summarizes the benefits associated with revising military specifications for boilers to eliminate inconsistencies and conflicts between private industry and the Government and the benefits of adding specifications to meet DoD's alternative fuels requirements.

BACKGROUND

The Federal Government, including the Navy, owns thousands of buildings, most of which use boilers as the primary source of space heating. Boilers are also used with some absorption refrigeration equipment to provide cooling. Boiler plants are also important to many Navy and other Government industrial activities. The Federal Government spends tens of millions of dollars each year on the purchase, operation, maintenance, and repair of boilers. These boilers must function satisfactorily and have long useful lives; thus, the Government is primarily interested in procuring quality boilers at reasonable life-cycle costs (i.e., purchase, operation, maintenance, and repair).

Boilers are manufactured in many sizes, ranging from "package boilers" that are relatively small, self-contained units requiring little or no operation and maintenance by trained workers to large, complex boiler plants that provide heat to all buildings on a military installation and require full-time operation by specially trained workers.

Boilers use a variety of fuels, including gas, oil and coal, and in some cases, DoD requires them to operate on both primary and alternative fuels (e.g., gas as the primary fuel and coal as the alternative).

The specific uses of a particular boiler application, including the alternative fuels requirement, make it important to use proper specifications in procurement actions. Prior to 1990, the Navy maintained seven military specifications for boilers.

However, those specifications did not always contain criteria that were consistent with private industry criteria for rating boilers. Also, those specifications did not contain the DoD alternative fuels requirements. Those seven military specifications for boilers are shown in Table H-1.

TABLE H-1
MILITARY SPECIFICATIONS FOR NONRESIDENTIAL BOILERS

Specification	Title
MIL-B-17228 (Revised)	Boilers, Steam and Hot water, Watertube (Coil and Serpentine), Packaged Type (40,000 to 10,000,000 BTU/hr Thermal Output Capacity)
MIL-B-17452 (Revised)	Boilers, Steam and Hot water, Firetube, Scotch, Packaged Type (320,001 to 35,000,000 BTU/hr Thermal Output Capacity)
MIL-B-17095 (Revised)	Boilers, Steam, Watertube (Bent Tube, Multi-Drum and Cross Drum), Packaged Type (10,000,000 to 125,000,000 BTU/hr Thermal Output Capacity)
MIL-B-18796 (Revised)	Burners, Single: Oil, Gas, and Gas-Oil Combination for Packaged Boilers (320,001 to 125,000,000 BTU/hr Thermal Output Capacity)
MIL-B-18797 (Revised)	Burners, Single: Light Oil, Gas, and Light Oil-Gas Combination for Packaged Heating Boilers (Up to 320,000 BTU/hr Thermal Output Capacity)
MIL-B-18897 (Revised)	Boilers, Steam and Hot water, Watertube (Straight Bare and Finned Tube), Cast Iron and Firebox, Packaged Type (40,000 to 35,000,000 BTU/hr Thermal Output Capacity)
MIL-B-29205 (Revised)	Boilers, Fluidized Bed, Steam and Hot Water, Packaged Type (330 to 51,500 Pounds per Hour Thermal Output Capacity)
MIL-S-28683 (New)	Stokers, Mechanical: For Packaged Boilers Fired on Coal or a Combination of Coal-Gas, Coal-Oil, or Coal-Gas-Oil (2,000,000 to 50,000,000 BTU/hr Thermal Output Capacity)
MIL-B-28684 (New)	Boilers, Steam and Hot Water, Vertical Firetube and Vertical Tubeless, Packaged Type (40,000 to 10,000,000 BTU/hr Thermal Output Capacity)
MIL-B-28685 (New)	Baghouse, Reverse Pulse Jet; for Packaged Boilers Fired on Coal or a Combination of Coal and Gas, Coal and Oil, or Coal-Gas-Oil (2,000,000 to 125,000,000 BTU/hr Thermal Output Capacity)
MIL-B-28686 (New)	Boilers, Hot Water, Watertube, (Bent Tube, Multi-Drum and Cross Drum) Packaged Type (320,001 to 125,000,000 BTU/hr Thermal Output Capacity)

The main criteria used by the Navy to rate boilers in those seven specifications came from two studies by the National Science Foundation, and include such criteria as furnace volumes and heat release rates.^{1, 2}

PROBLEMS

The inconsistencies between boiler rating criteria of the Federal Government and private industry, differences between Government design requirements and industry design practices, and the lack of specifications for the DoD alternative fuels requirements have created numerous administrative and operational problems. For example, the differences in boiler rating criteria caused Government inspectors to raise military specification compliance issues with some manufacturers' products. And, differences between Government design requirements and industry practices caused some manufacturers to believe that their products were being discriminated against, resulting in numerous bid protests that lengthened and increased the costs of procurement actions.

DISCUSSION

The additional costs incurred because of compliance issues, bid protests, and lack of specifications for alternative fuels requirements unnecessarily added to the the Federal Government's cost and procurement schedules for boilers. They are also inconsistent with the Defense Standardization Program's objective of tailoring specifications to reflect commercial practices whenever possible.

OUTCOME

In 1984, the Naval Facilities Engineering Command began a program of revising the military specifications for boilers to resolve the problems discussed above. The seven original specifications were revised to eliminate inconsistencies in terminology. Definitions of heat transfer, furnace volumes, and heat release rates were clarified and made consistent with private industry terminology. The specifications were also revised to minimize conflicts between Government specific design requirements and current industry design practices. Finally, four new specifications were added to ensure DoD's alternative fuels requirements were

¹*Boiler Rating Criteria for Nonresidential Boilers*, Building Research Advisory Board, National Research Council, National Academy of Sciences, Technical Report No. 44, 1962.

²*Nonresidential Steam Boilers and Hot-water Generators*, Building Research Advisory Board, National Research Council, National Academy of Sciences, Technical Report No. 71, 1979.

included for steam, or power-generating, plant construction (see Table H-1). The revisions and additions to military specifications for boilers were completed and published in September 1990.

PAYOFFS

One of the most visible benefits of the Navy program to date is that the Navy has not received a single bid protest in its boiler procurements since it started using the revised and new specifications. Other Government agencies have probably also experienced a significant decline in bid protests. Without protests to resolve, the Navy has experienced shorter lead times and shorter procurement cycles, for all types of boilers. Because the revised specifications were published only 1 year ago, it is too early to know whether compliance issues will disappear; however, we fully expect such issues to decrease significantly because of the congruence of Governmental and private industry terminology achieved by the revised specifications. Another significant benefit is that the new specifications ensure that properly manufactured and sized boilers can be procured for burning alternative fuels.